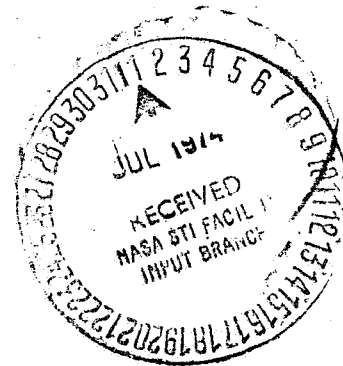


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*D.R.A.*  
*lean*

# APOLLO/SATURN V POSTFLIGHT TRAJECTORY AS-510



NOVEMBER 23, 1971

THE **BOEING** COMPANY - SPACE DIVISION

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TRACKING AND FLIGHT RECONSTRUCTION  
G. T. PINSON

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*W B Morgan*

W. B. MORGAN

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## REVISIONS

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## ABSTRACT AND LIST OF KEY WORDS

This document presents the postflight trajectory for the Apollo/Saturn V AS-510 flight. Included is an analysis of the orbital and powered flight trajectories of the launch vehicle and the free flight trajectories of the expended S-IC and S-II stages. Trajectory dependent parameters are provided in earth-fixed launch site, launch vehicle navigation, and geographic polar coordinate systems. The time history of the trajectory parameters for the launch vehicle is presented from guidance reference release to Command Service Module (CSM) separation.

Tables of significant parameters at engine cutoff, stage separation, parking orbit insertion, and translunar injection are included in this document. Figures of such parameters as altitude, surface and cross range, and the magnitude of total velocity and acceleration as a function of range time for the powered flight trajectories are presented.

Apollo/Saturn V  
AS-510  
Postflight Trajectory  
Powered Flight Trajectory  
Orbital Trajectory  
Spent Stage Trajectory  
Apollo 15



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REFERENCES

1. NASA Document SE 008-001-1, "Project Apollo Coordinate System Standards," June 1965
2. NASA Document MPR-SAT-FE-71-2, "Saturn V Launch Vehicle Flight Evaluation Report - AS-510 Apollo 15 Mission," October 28, 1971
- 3a. Boeing Document D5-15551(I)-10, "Saturn V AS-510 Launch Vehicle Operational Flight Trajectory - July 26 and 27, 1971 Launch Days," April 26, 1971
- 3b. Boeing Memorandum 5-9424-H-331, "AS-510 Launch Vehicle Operational Trajectory Update for July 26, 1971 Launch," June 30, 1971
4. NASA Document M-D E 8020.008B, "Natural Environment and Physical Standards for the Apollo Program," April 1965

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## GLOSSARY OF TERMS

Altitude	The distance between the vehicle and its subvehicle point on the surface of the Fischer Ellipsoid
Ascent Phase	The segment of the vehicle flight from launch to parking orbit insertion
Azimuth Angle	The angle, positive clockwise, from true north to the projection of the slant range vector on the ground station tangent plane (PACSS3a)
Cross Range	The vehicle lateral position measured in the earth-fixed launch site centered coordinate system (PACSS10)
Dynamic Pressure	The force per unit area of the atmosphere on the vehicle resulting from its motion through the atmosphere
Elevation Angle	The angle between the slant range vector and its projection on the ground station tangent plane. This angle is positive above the ground station tangent plane (PACSS3a).
Flight Path Angle	The angle between the vehicle space-fixed velocity vector and a plane normal to a vector from the center of the earth to the vehicle. This angle is positive above the plane.
Inertial Acceleration	The magnitude of the vehicle acceleration in the launch vehicle platform accelerometer coordinate system (PACSS12)
Latitude (geodetic)	The angle between the equatorial plane and the line normal to the ellipsoidal surface at a specified point, measured positive north in the meridian of the point.

## GLOSSARY OF TERMS (Continued)

Longitude	The angle between the plane of the Greenwich Meridian and the plane of the meridian containing the specified point measured positive eastward from the Greenwich Meridian
Mach Number	The ratio of the vehicle velocity relative to the surrounding atmosphere to the speed of sound in the atmosphere
Measured Parameter	A primary measurement made by any ground station, e.g., elevation angle
Parking Orbit Phase	The segment of the vehicle flight from parking orbit insertion to S-IVB restart preparation
Second Burn Phase	The segment of the vehicle flight from S-IVB restart preparation to TLI
Slant Range	The distance between a ground station and the vehicle (PACSS3a, PACSS3c, and PACSS3d)
Slant Range Rate	The velocity of the vehicle along a vector from the ground station to the vehicle (PACSS3c and PACSS3d)
Space-Fixed Velocity	The magnitude of the vehicle velocity in the launch vehicle navigation coordinate system (PACSS13)
Subvehicle Point	The point of intersection of the ellipsoidal surface and a line normal to this surface passing through the vehicle center of mass
Surface Range	The arc length between the launch site and subvehicle point measured along the surface of the Fischer Ellipsoid
Translunar Orbit Phase	The segment of the vehicle flight from TLI to CSM separation



## GLOSSARY OF TERMS (Continued)

## X-Angle

30' Antennas - The angle measured in the plane of the ground station prime vertical from the zenith to the projection of the slant range vector onto this plane, positive eastward.

85' Antennas - The angle measured in the meridian plane of the ground station from the zenith to the projection of the slant range vector onto this plane, positive southward (PACSS3c and PACSS3d, respectively).

## Y-Angle

30' Antennas - The angle between the slant range vector and its projection onto the plane of the ground station prime vertical, positive when the slant range vector is north of the plane.

85' Antennas - The angle between the slant range vector and its projection onto the meridian plane of the radar site, positive when the slant range vector is east of the meridian plane (PACSS3c and PACSS3d, respectively).

## LIST OF ABBREVIATIONS

ABBREVIATION	DEFINITION/STATION
BDA (67.16)	Bermuda (FPS-16M) C-Band
BDQ (67.18)	Bermuda (FPQ-6) C-Band
BDS	Bermuda S-Band
CECO	Center Engine Cutoff
CNV (1.16)	Cape Kennedy C-Band
CRO	Carnarvon C-Band
CSM	Command Service Module
EMR	Engine Mixture Ratio
EPO	Earth Parking Orbit
GATE	Guidance and Tracking Evaluation Program
GCS1 (1st GCS)	First Guidance Cutoff Signal
GCS2 (2nd GCS)	Second Guidance Cutoff Signal
GDS	Goldstone, California S-Band
GRR	Range Time of Guidance Reference Release
GTK (7.18)	Grand Turk C-Band
HWI	Hawaii S-Band
IP Raw MP	Impact Predictor Raw Measured Parameters
IU	Instrument Unit
LH2	Liquid Hydrogen
LM	Lunar Module
MAD	Madrid S-Band
MIL	Merritt Island S-Band
MLA (19.18)	Merritt Island C-Band
MSFN	Manned Space Flight Network
OCP	Orbital Correction Program
OECO	Outboard Engine Cutoff
OMPT	Observed Mass Point Trajectory
PACSS	Project Apollo Coordinate System Standards
PAT (0.18)	Patrick Air Force Base C-Band
PIR	Goldstone Wind S-Band
POI	Parking Orbit Insertion
REV	Revolution
RID	Madrid Wing S-Band
rss	Root Sum Square
STDV	Start Tank Discharge Valve
TEX	Corpus Christi, Texas S-Band
TLI	Translunar Injection
USB	Unified S-Band

## SOURCE DATA PAGE

The following listed government-furnished documentation was used in the preparation of this document:

EXHIBIT FF LINE ITEM NUMBER	GFD TITLE	DATE RECEIVED
S&E-AERO-P-#35c	OMPT Format	6/15/71
S&E-AERO-P-#17	Tracking and Network Specifications	7/19/71
	Postlaunch Operational Trajectory Certified Data	7/16/71
I-MO-#4a	Insertion Point and/or Orbital Elements	7/28/71
I-MO-#4c	Six Seconds Raw Radar	7/28/71
I-MO-#4f	Meteorological Data (Final)	7/28/71
I-MO-#6	IP Raw MP	7/27/71
I-MO-#9	Pulse Radar: BDA, BDQ, MLA, and CRO Data	7/28/71
	USB: MIL, BDS, HAW, TEX, RID, MAD, PIR, and GDS Data	8/2/71
I-MO-#17c	Final Significant Time of Events	8/6/71
I-MO-#18b	Final Guidance Velocities Ascent Phase	7/27/71
	2nd Burn Phase	8/5/71
I-MO-#18c	Orbital Venting Acceleration Data Cards	8/5/71

## SECTION 1

## SUMMARY AND INTRODUCTION

The Apollo Saturn V AS-510 vehicle was launched from Launch Complex 39, Pad A, at the Kennedy Space Center on July 26, 1971, at 9:34:00 A.M. Eastern Daylight Time (Range Time Zero) at an azimuth of 90 degrees east of north. Guidance reference release (GRR) occurred at -16.939 seconds. First motion occurred at 0.3 seconds. A roll maneuver was initiated at 12.2 seconds to place the vehicle on a flight azimuth of 80.088 degrees east of north.

All trajectory parameters were close to nominal from liftoff to parking orbit insertion except the insertion time occurred 4.39 seconds early. The vehicle was inserted into parking orbit at 704.67 seconds at an altitude of 172.6 km (93.2 nmi) and a total space-fixed velocity of 7,803.7 m/s (25,602.7 ft/s). The vehicle remained in orbit for approximately one and two-thirds revolutions. The S-IVB stage was restarted during the second revolution over the Pacific Ocean at 10,202.9 seconds.

At 10,563.61 seconds, the vehicle was injected into a near-nominal translunar trajectory at an altitude of 321.7 km (173.7 nmi) and a total space-fixed velocity of 10,844.5 m/s (35,579.1 ft/s). At 12,147.2 seconds, the CSM separated from the launch vehicle at an altitude of 7,460.1 km (4,028.1 nmi) and a total space-fixed velocity of 7,494.0 m/s (24,586.6 ft/s).

The impact location of the spent S-IC stage was determined to be 29.420 degrees north latitude and 73.653 degrees west longitude at 560.8 seconds. The impact location of the spent S-II stage was determined to be 26.975 degrees north latitude and 37.924 degrees west longitude at 1,183.9 seconds.

A more detailed description of the postflight mass point launch vehicle trajectory and launch parameters is given in Section 2. The trajectory is divided into the following phases, each discussed in a separate subsection of Section 2:

- a. Ascent (guidance reference release to parking orbit insertion)
- b. Parking Orbit (orbit insertion to S-IVB restart preparation)
- c. Second Burn (S-IVB restart preparation to translunar injection)
- d. Translunar Orbit (translunar injection to CSM separation)
- e. Free Flight (expended S-IC and S-II stages)

## SECTION 1 (Continued)

The trajectories for the first four of the above phases were established from external C-band radar and S-Band tracking data and ST-124M inertial platform onboard telemetered guidance velocity data. No tracking data was available for the S-IC and S-II spent stages, so the trajectory phases outlined in (e) above were simulated using actual separation conditions and nominal drag and retrorocket performance data.

Section 3 contains a description of the trajectory reconstruction methods, a summary of the tracking data used in the analysis with the resulting residual plots, and an estimate of the uncertainty in the reconstructed trajectory.

Appendix A provides a definition of the symbols, nomenclature, and coordinate systems used in the report. Appendix B is a tabular history of selected trajectory parameters in metric units. Appendix C presents the same parameters expressed in English units.

## SECTION 2

## TRAJECTORY DESCRIPTION

This section describes the reconstructed trajectory, referenced to the Instrument Unit (IU), by providing plotted histories of pertinent variables and tables of important parameters at significant event times. The complete time history of selected Observed Mass Point Trajectory (OMPT) parameters, in both metric and English units, is tabulated in Appendices B and C, respectively. These tabulations are given in accordance with "Project Apollo Coordinate System Standards" (PACSS, Reference 1) and are in earth-fixed launch site (PACSS10), launch vehicle navigation (PACSS13), and geographic polar (PACSS1) coordinate systems. For convenience, these systems are described in Appendix A along with a definition of other terms and symbols used.

A comparison of actual and nominal times for significant flight events is presented in Table 2-I. The actual times for these events are taken from Reference 2. The nominal times are taken from Reference 3. Range time, which is referenced to Range Time Zero, is used throughout this document unless otherwise specified. Range Time Zero was established at 13:34:00 Greenwich Mean Time on July 26, 1971.

The Fischer Ellipsoid of 1960 (Reference 4) is used as the representative model for the earth and its gravitational field. All latitude and longitude coordinates are defined with respect to this ellipsoid.

The geographic coordinates for Launch Complex 39, Pad A, at the Kennedy Space Center are as follows:

Geodetic Latitude	28.608422 degrees north
Longitude	80.604133 degrees west

The height of the Instrument Unit of the launch vehicle above the reference ellipsoid is 111.65m (366.31 ft).

The azimuth alignments are as follows:

Launch Azimuth	90.0 degrees east of north
Flight Azimuth	80.088 degrees east of north
ST-124M Platform Azimuth	80.089 degrees east of north

The flight azimuth, dependent on the launch time, launch day and month, is calculated using polynomial coefficients taken from the guidance presettings in order to achieve the desired translunar targeting parameters. The translunar

## SECTION 2 (Continued)

targeting parameters are functions of the moon position, earth parking orbit inclination, earth-moon distance, and moon travel rate.

## 2.1 ASCENT PHASE

The trajectory parameters from guidance reference release to parking orbit insertion were close to nominal except for the insertion time which was 4.39 seconds early. The space-fixed velocity and altitude at S-IC OECO were 9.2 m/s (30.2 ft/s) greater than and 0.2 km (0.1 nmi) less than nominal, respectively. At S-II OECO, the space-fixed velocity and altitude were 9.8 m/s (32.2 ft/s) and 0.5 km (0.3 nmi) greater than nominal, respectively. The space-fixed velocity was 0.6 m/s (2.0 ft/s) less than nominal and the altitude was 0.8 km (0.4 nmi) greater than nominal at S-IVB first guidance cutoff signal. The maximum acceleration was  $38.97 \text{ m/s}^2$  (3.97 g) during the S-IC phase.

Significant trajectory events, such as Mach 1, maximum acceleration, etc., are tabulated in Table 2-II. Trajectory parameters at engine cutoff times are presented in Table 2-III. Table 2-IV shows trajectory parameters at stage separation times.

To supplement these tabulations at discrete times, a number of quantities are plotted over the entire ascent phase. Figure 2-1 shows the vehicle ground track and the location of the tracking stations used in the reconstruction. Altitude, surface range, and cross range are plotted versus time in Figures 2-2 through 2-4, respectively. Space-fixed velocity and flight path angle are shown in Figure 2-5. Figure 2-6 gives total inertial acceleration. Dynamic pressure and mach number are plotted in Figure 2-7. The ascent phase trajectory is tabulated in Tables B-I through B-III in metric units, and in Tables C-I through C-III in English units..

## 2.2 PARKING ORBIT PHASE

The parking orbit spans the interval from insertion to S-IVB restart preparation at 9,624.8 seconds. Figure 2-8 gives the vehicle ground track following parking orbit insertion (POI) and shows the vehicle position at significant event times (see Table 2-I).

## 2.2 (Continued)

The S-IVB/LM/CSM was inserted into a near circular earth parking orbit (EPO) at 704.67 seconds, 4.39 seconds earlier than nominal. The parking orbit insertion conditions were close to nominal. Table 2-V gives the actual parking orbit insertion conditions and provides a comparison with the nominal values.

During the parking orbit, no major thrusting occurred; however, the orbit was continuously perturbed by low-level LH<sub>2</sub> venting. This perturbation was considered in this analysis. An acceleration model was built from telemetered guidance velocity data from the ST-124M guidance platform. The guidance velocity data were fitted in segments by polynomials in time. The polynomials were analytically differentiated to model the component accelerations sensed by the guidance platform. Table 2-VI lists the acceleration polynomials derived by this method. Figure 2-9 reflects the best estimate of the total parking orbit acceleration (rss of components) after modeling biases have been removed.

The parking orbit phase is tabulated in Table B-IV in metric units and in Table C-IV in English units.

## 2.3 SECOND BURN PHASE

The second burn trajectory phase spans the interval from S-IVB restart preparation at 9,624.8 seconds to translunar injection. The S-IVB stage was restarted 6.3 seconds later than nominal at 10,202.9 seconds on the second pass over the Pacific Ocean (see Table 2-I for significant event times). The vehicle ground track during this trajectory phase is shown in Figure 2-8 as a continuation of the parking orbit phase. Vehicle altitude is plotted in Figure 2-10. Figure 2-11 shows the space-fixed velocity and the flight path angle. Total inertial acceleration is shown in Figure 2-12.

The second guidance cutoff signal conditions, depicted in Table 2-III, were near nominal. Cutoff occurred 0.88 seconds later than nominal with the altitude 2.8 km (1.5 nmi) less than nominal, the space-fixed velocity 1.2 m/s (3.9 ft/s) greater than nominal, and the flight path angle 0.166 degrees less than nominal.

The second burn phase is tabulated in Tables B-V through B-VII in metric units and Tables C-V through C-VII in English units.



## 2.4 TRANSLUNAR ORBIT PHASE

The translunar orbit phase spans the interval from injection to S-IVB/CSM separation. Figure 2-8 shows the ground track continued through this trajectory phase.

Translunar injection occurred at 10,563.61 seconds, 0.88 seconds later than nominal (see Table 2-I). The translunar injection conditions were close to nominal. Table 2-VII gives the actual translunar orbit injection conditions and provides a comparison with the nominal values.

Accelerations during the period between translunar injection and CSM separation were treated as in parking orbit, representing them as segmented polynomials. Table 2-VIII lists these polynomial coefficients and time spans. The best estimate of the total translunar orbit acceleration (rss of components) after modeling biases have been removed is plotted in Figure 2-13.

Trajectory parameters at CSM separation (defined as the end of the launch vehicle trajectory) are listed in Table 2-IX. The translunar orbit phase is tabulated in Tables B-V through B-VII in metric units and Tables C-V through C-VII in English units.

## 2.5 FREE FLIGHT PHASES

### 2.5.1 S-IC Spent Stage Trajectory

Postflight predictions of earth surface impact parameters for the spent S-IC stage were computed using a mass point trajectory simulation computer program. S-IC postflight burnout position and velocity data were combined with nominal main propulsion system decay performance and nominal retrorocket performance to initialize the simulation program.

Three separate theoretical trajectories were computed for the spent S-IC stage. These three trajectories represent the following booster atmospheric entry conditions:

- a. Zero-degree angle-of-attack entry
- b. Ninety-degree angle-of-attack entry
- c. Tumbling entry

The tumbling booster case is considered to define actual case impact conditions although no tracking coverage was available for confirmation.

### 2.5.1 (Continued)

Results of the three computed S-IC spent stage trajectories are summarized in Table 2-X. The ground track is shown in Figure 2-14.

### 2.5.2 S-II Spent Stage Trajectory

Three separate theoretical trajectories, corresponding to the zero-degree, ninety-degree, and tumbling-case trajectories computed for the S-IC stage, were computed for the spent S-II stage.

The computed results, assuming a tumbling stage, were considered to define stage impact conditions since no tracking coverage of the spent S-II stage was available.

Results of the three computed S-II spent stage trajectories are summarized in Table 2-XI. The ground track is shown in Figure 2-14.

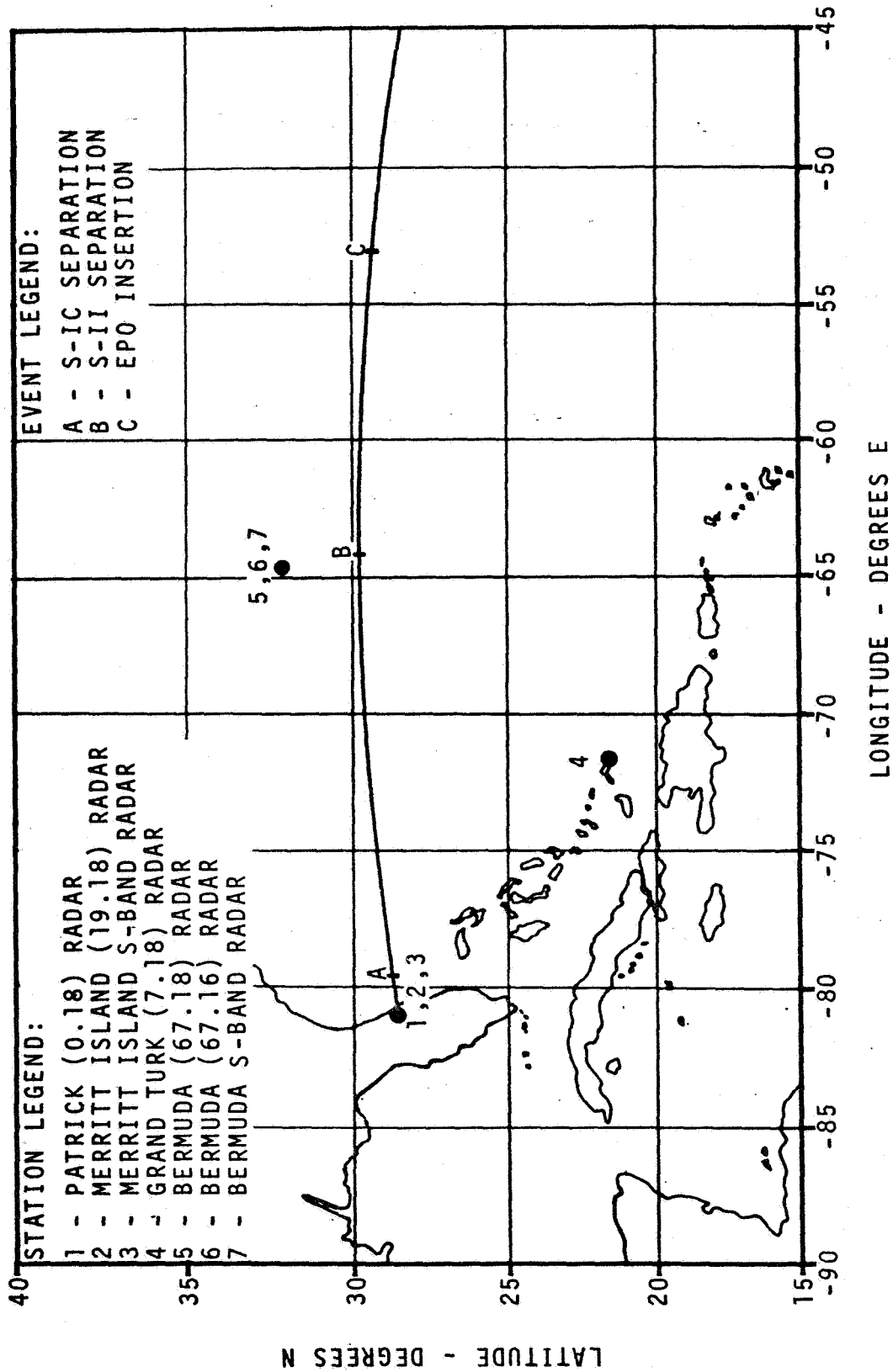


FIGURE 2-1. GROUND TRACK AND TRACKING STATIONS - ASCENT PHASE

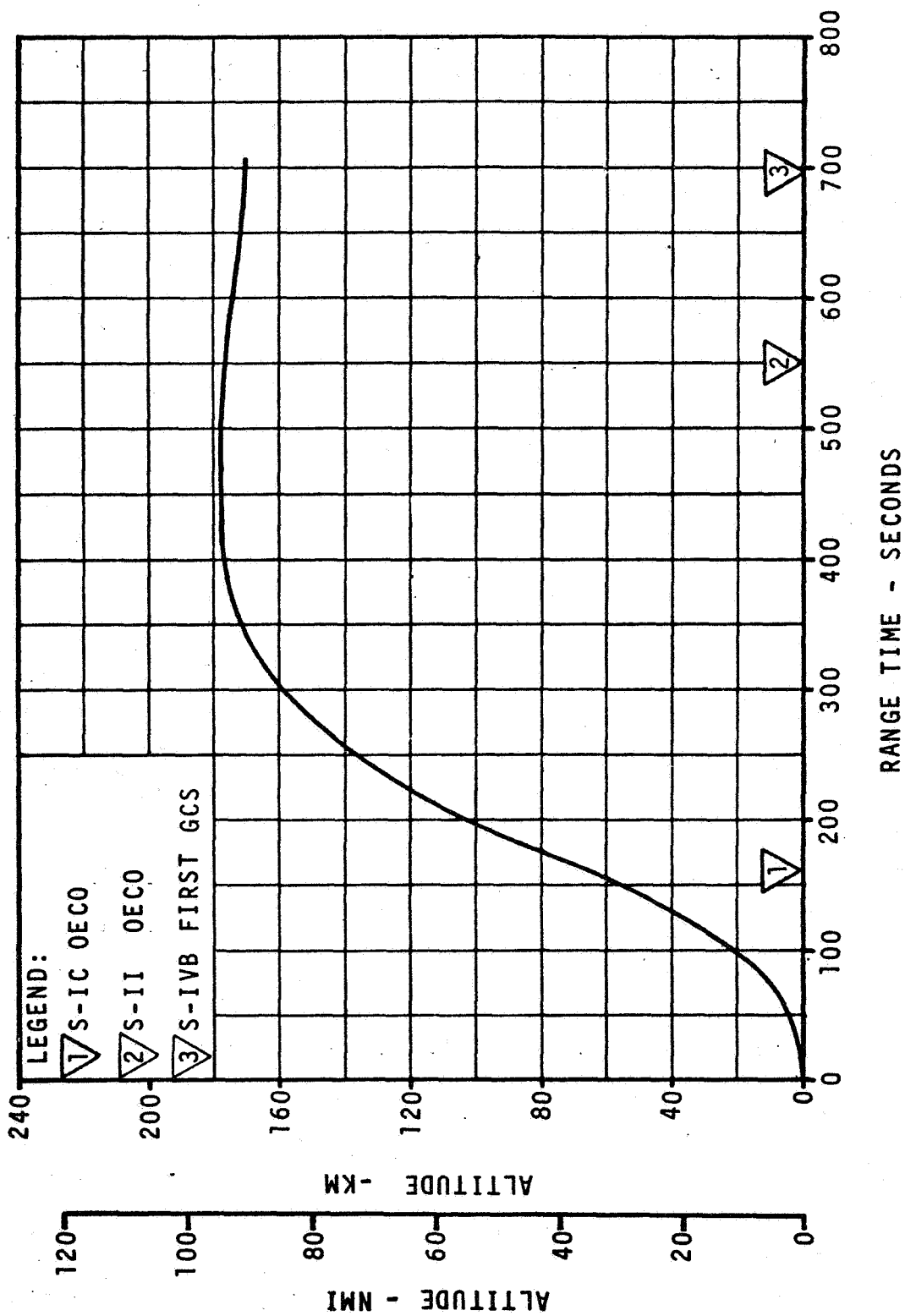


FIGURE 2-2. ALTITUDE - ASCENT PHASE

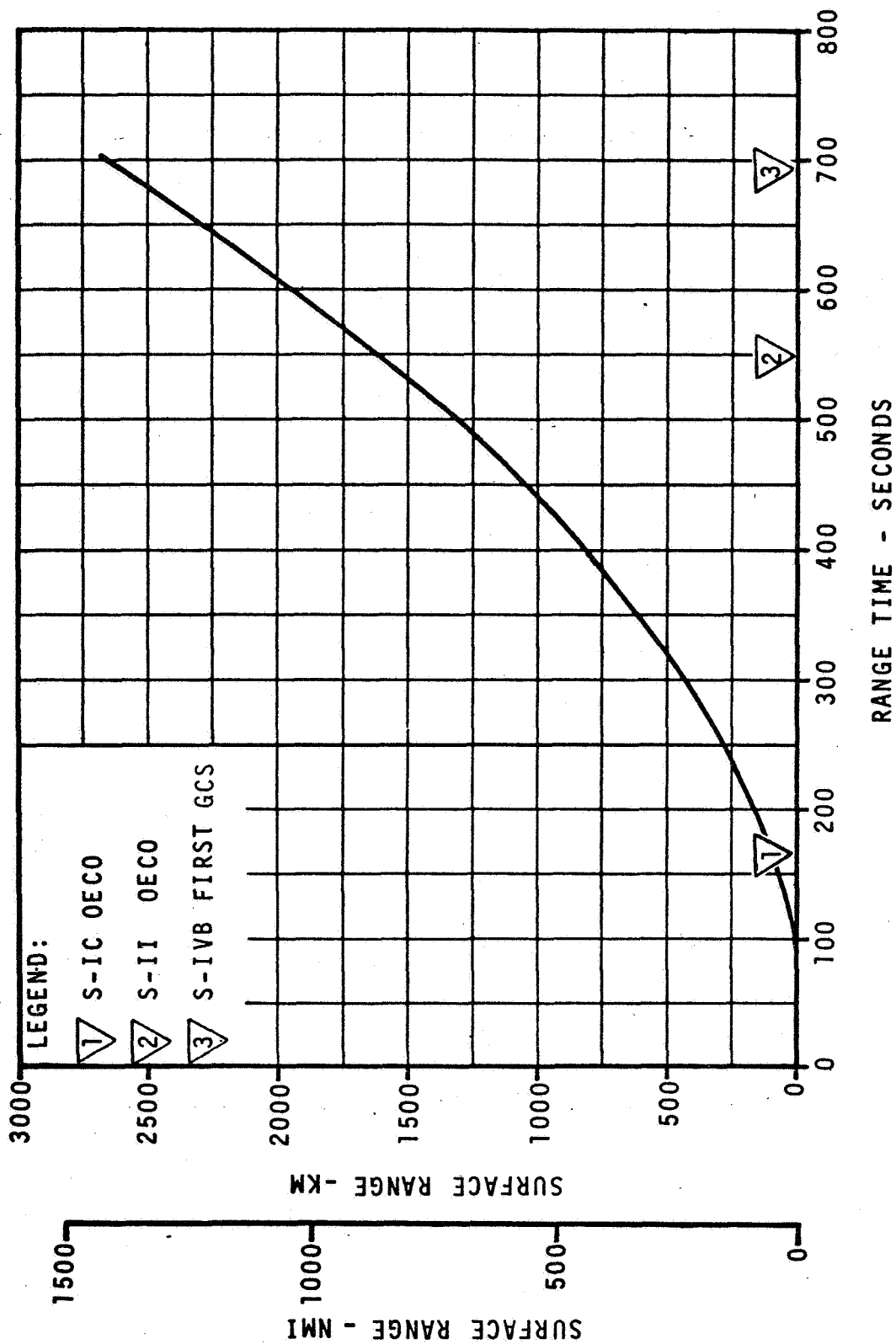


FIGURE 2-3. SURFACE RANGE - ASCENT PHASE

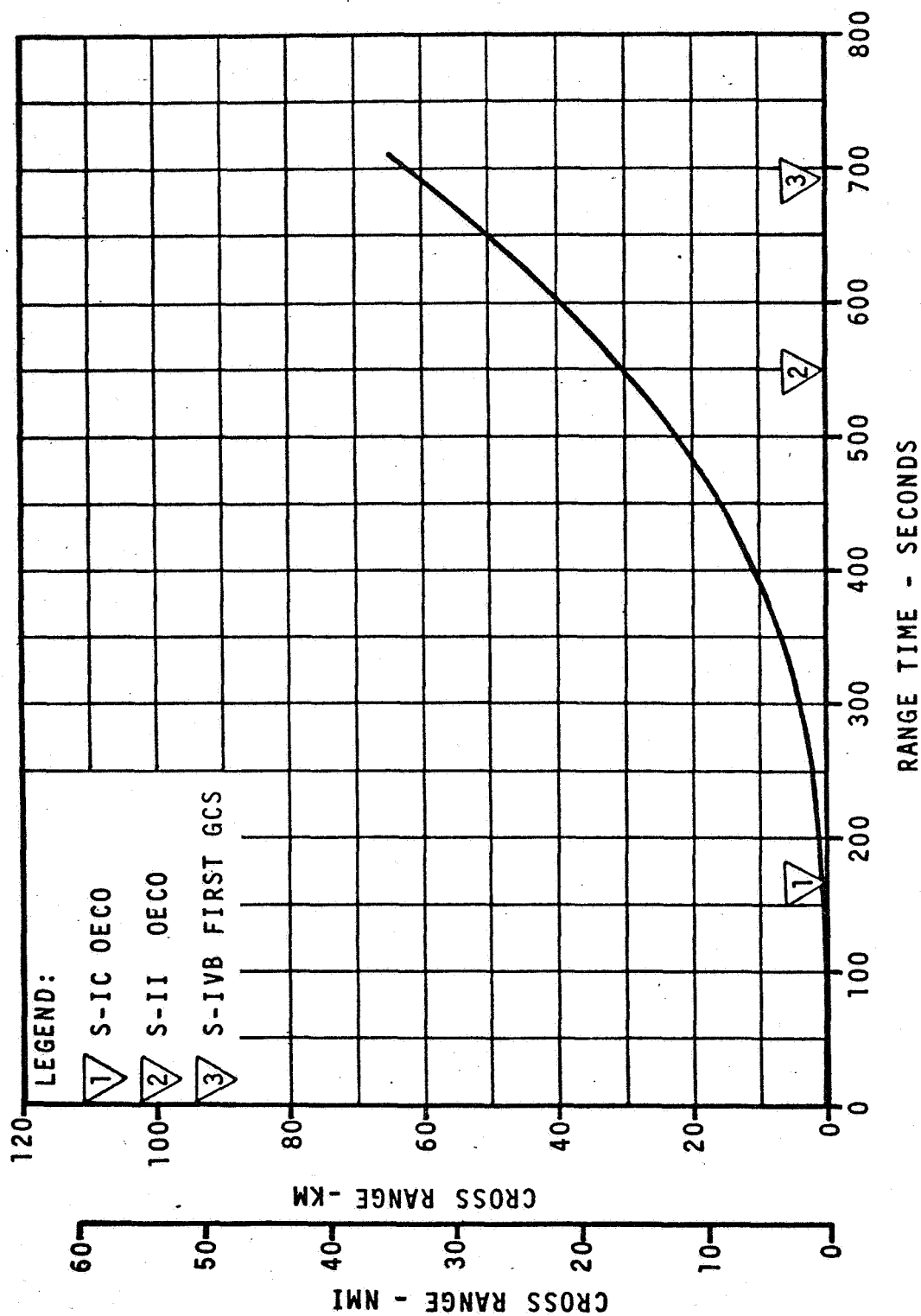


FIGURE 2-4. CROSS RANGE - ASCENT PHASE

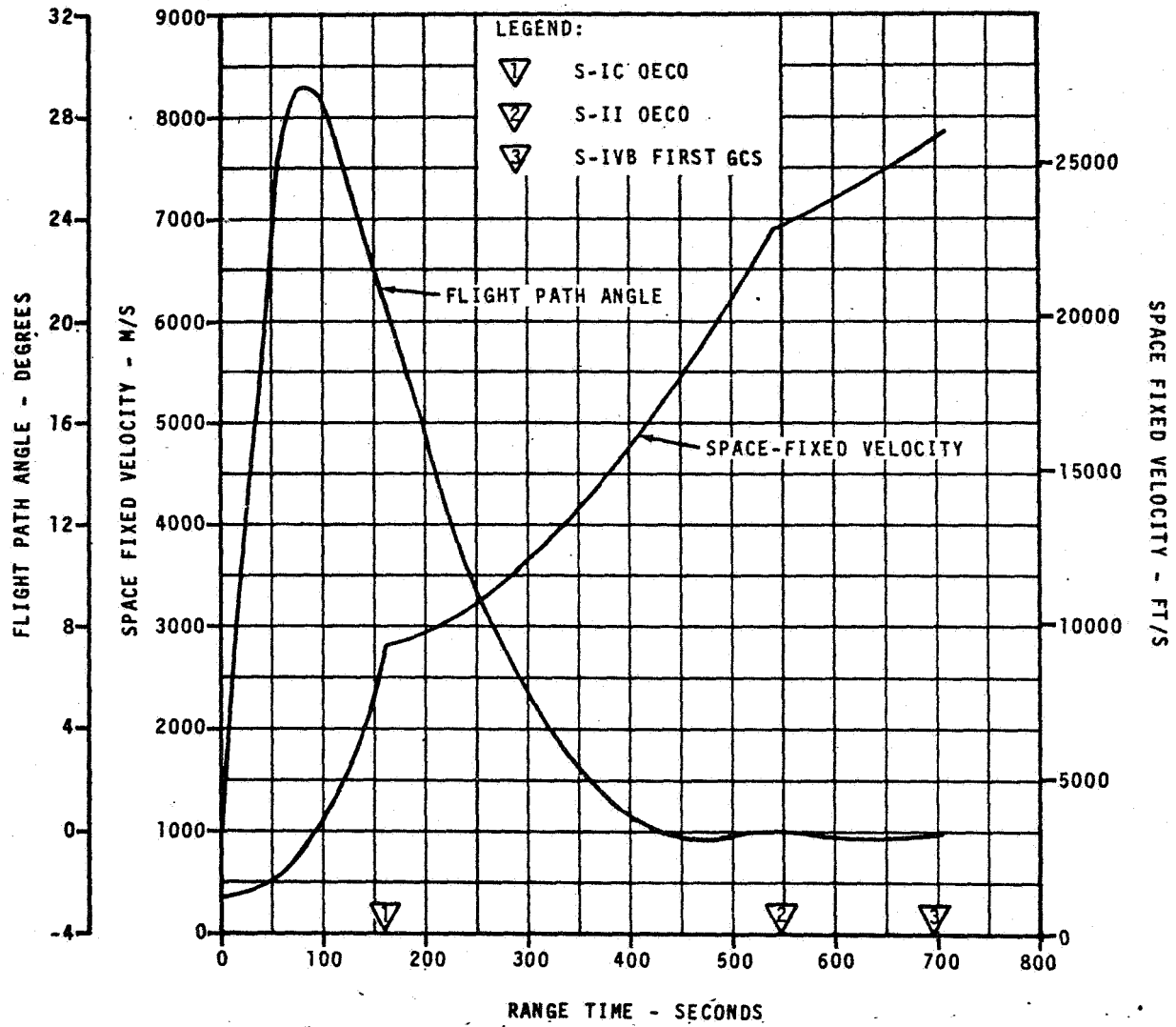


FIGURE 2-5. SPACE-FIXED VELOCITY AND FLIGHT PATH ANGLE  
- ASCENT PHASE

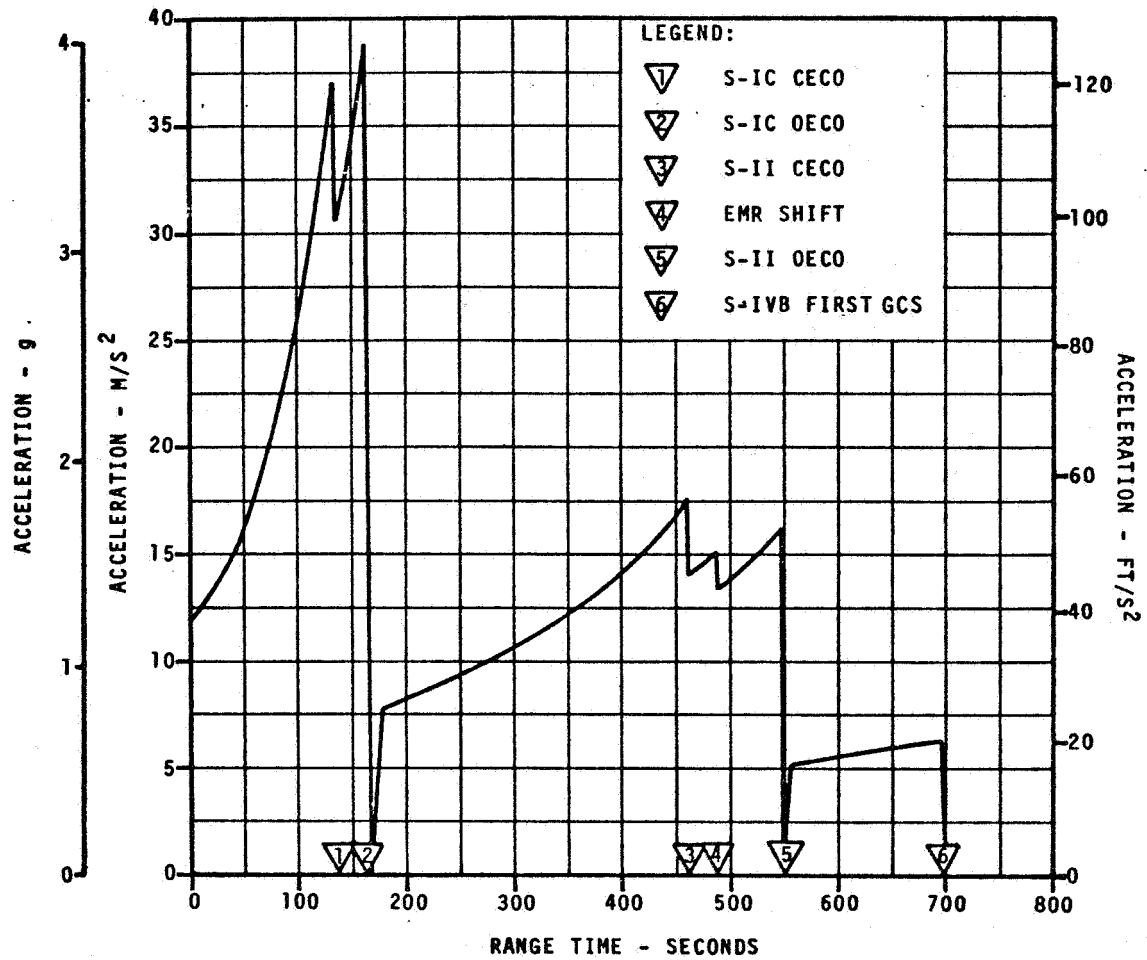


FIGURE 2-6. TOTAL INERTIAL ACCELERATION - ASCENT PHASE



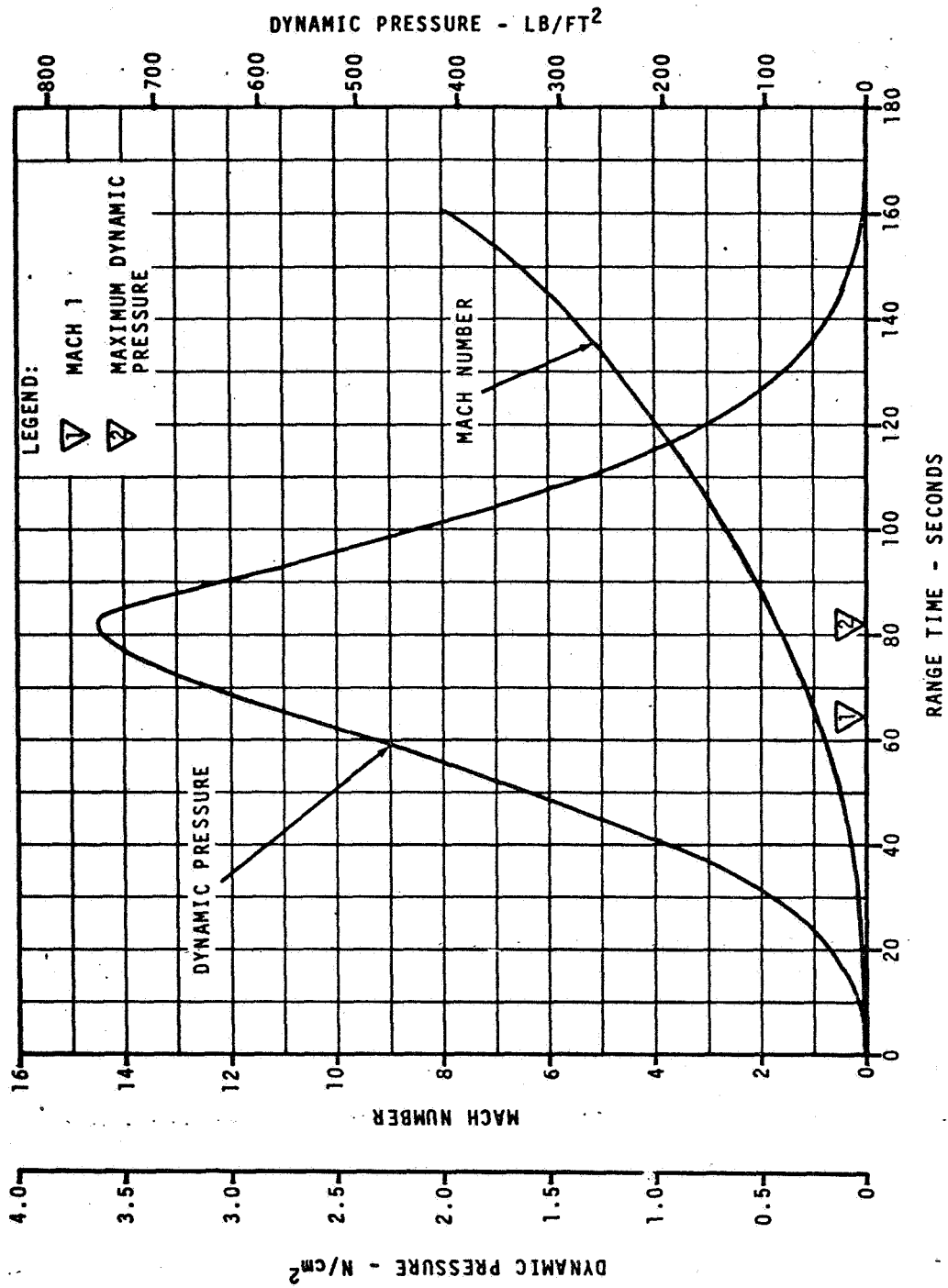


FIGURE 2-7. MACH NUMBER AND DYNAMIC PRESSURE - ASCENT PHASE (S-IC)

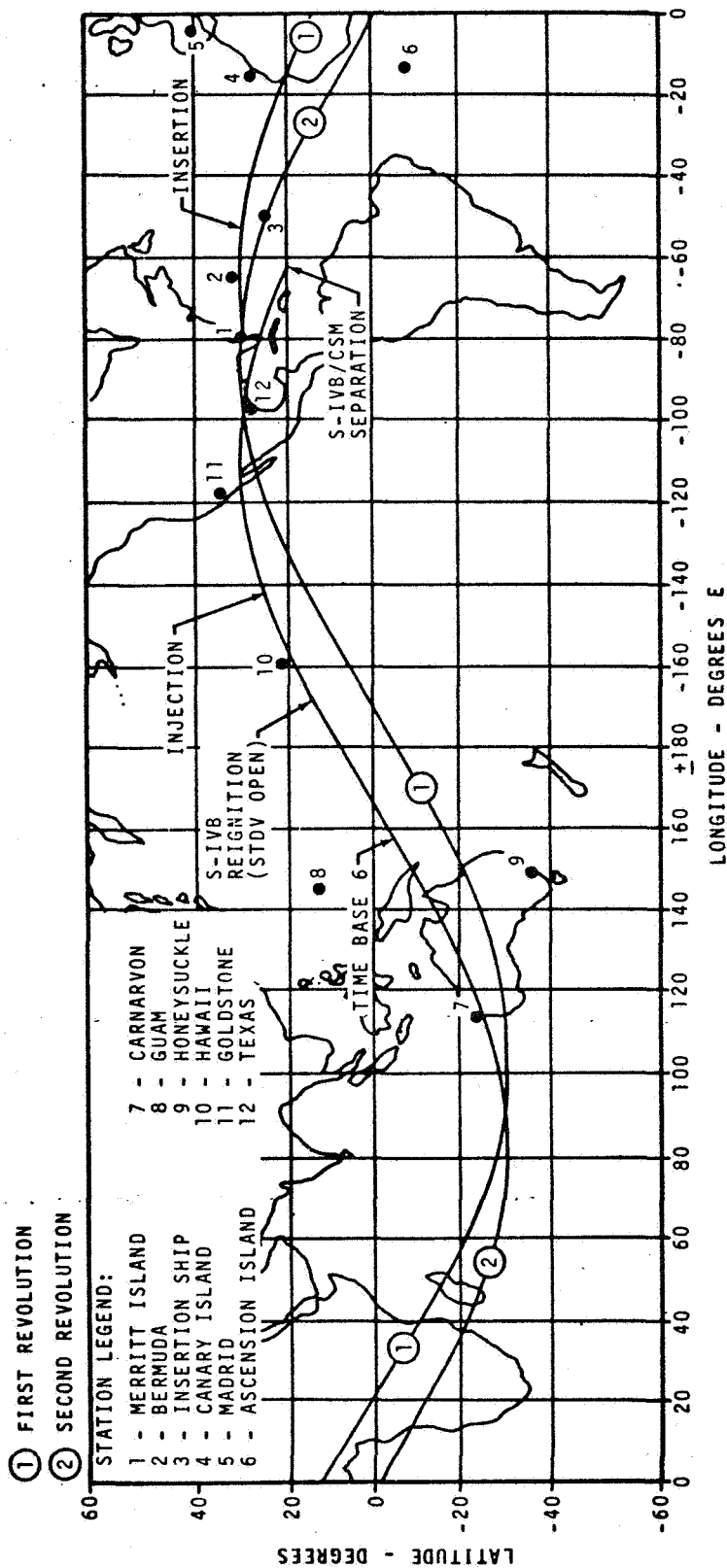


FIGURE 2-8. AS-510 LAUNCH VEHICLE GROUND TRACK

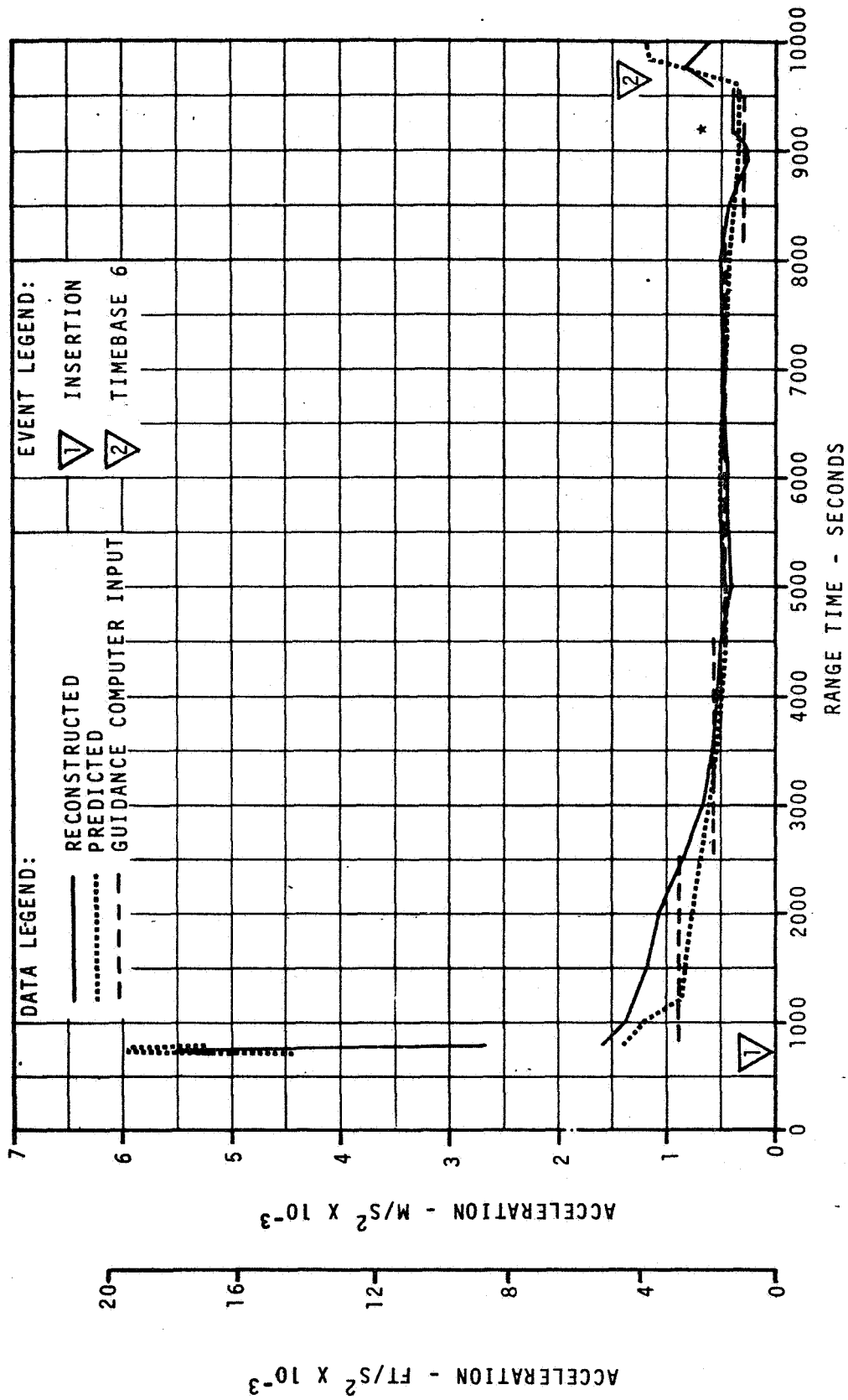


FIGURE 2-9 PARKING ORBIT ACCELERATION

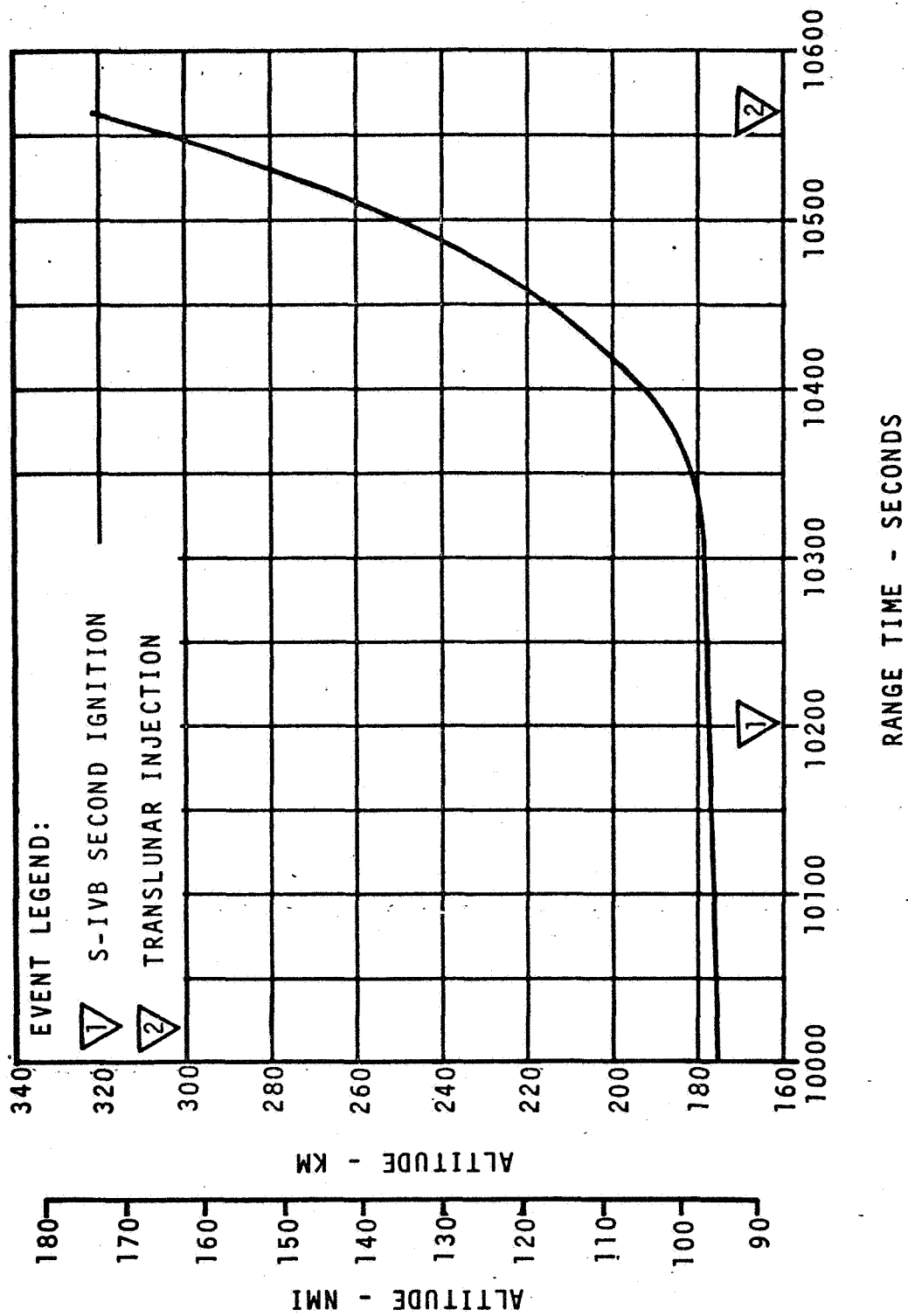


FIGURE 2-10. ALTITUDE - SECOND BURN PHASE

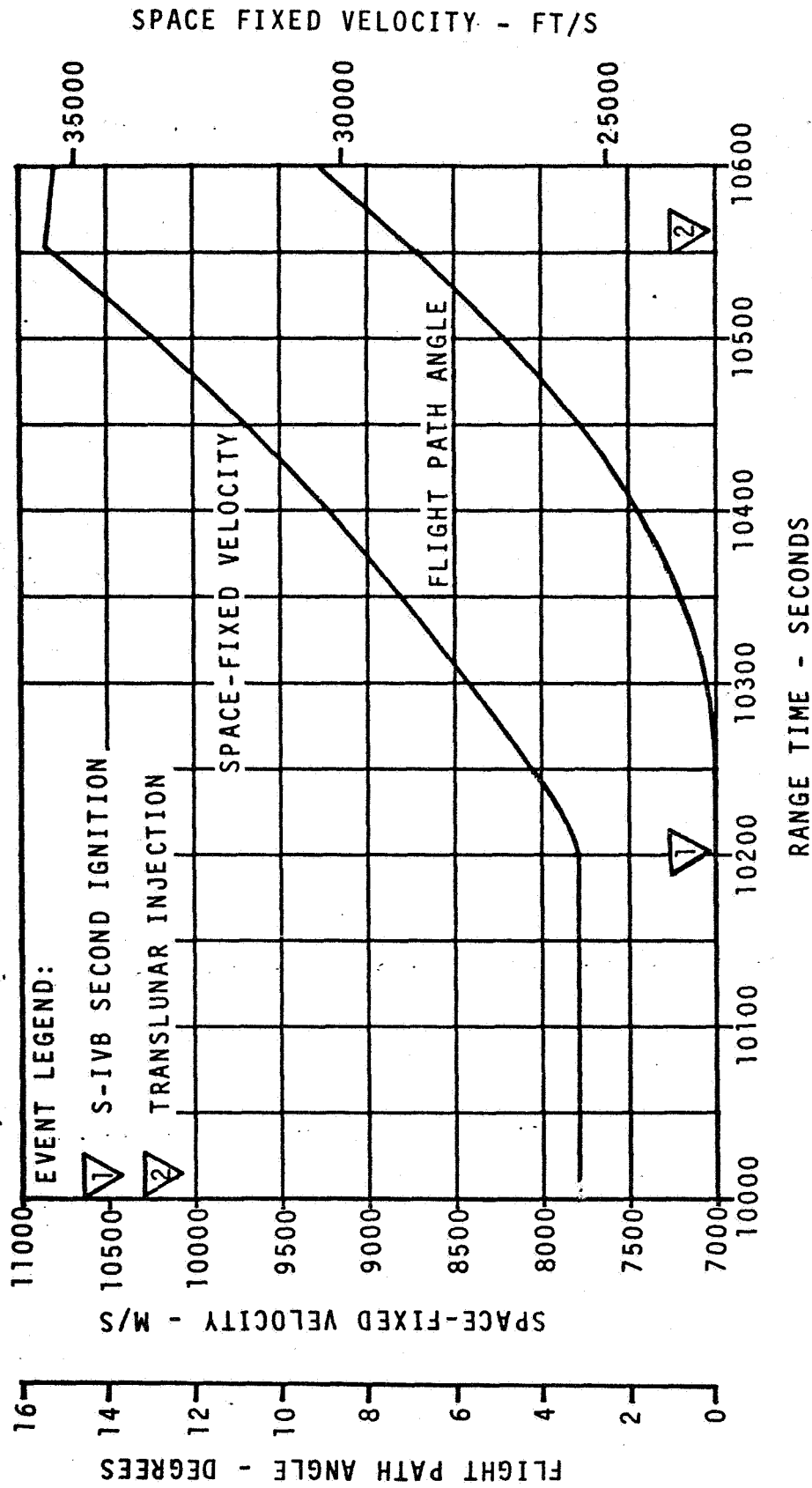


FIGURE 2-11. SPACE-FIXED VELOCITY AND FLIGHT PATH ANGLE - SECOND BURN PHASE

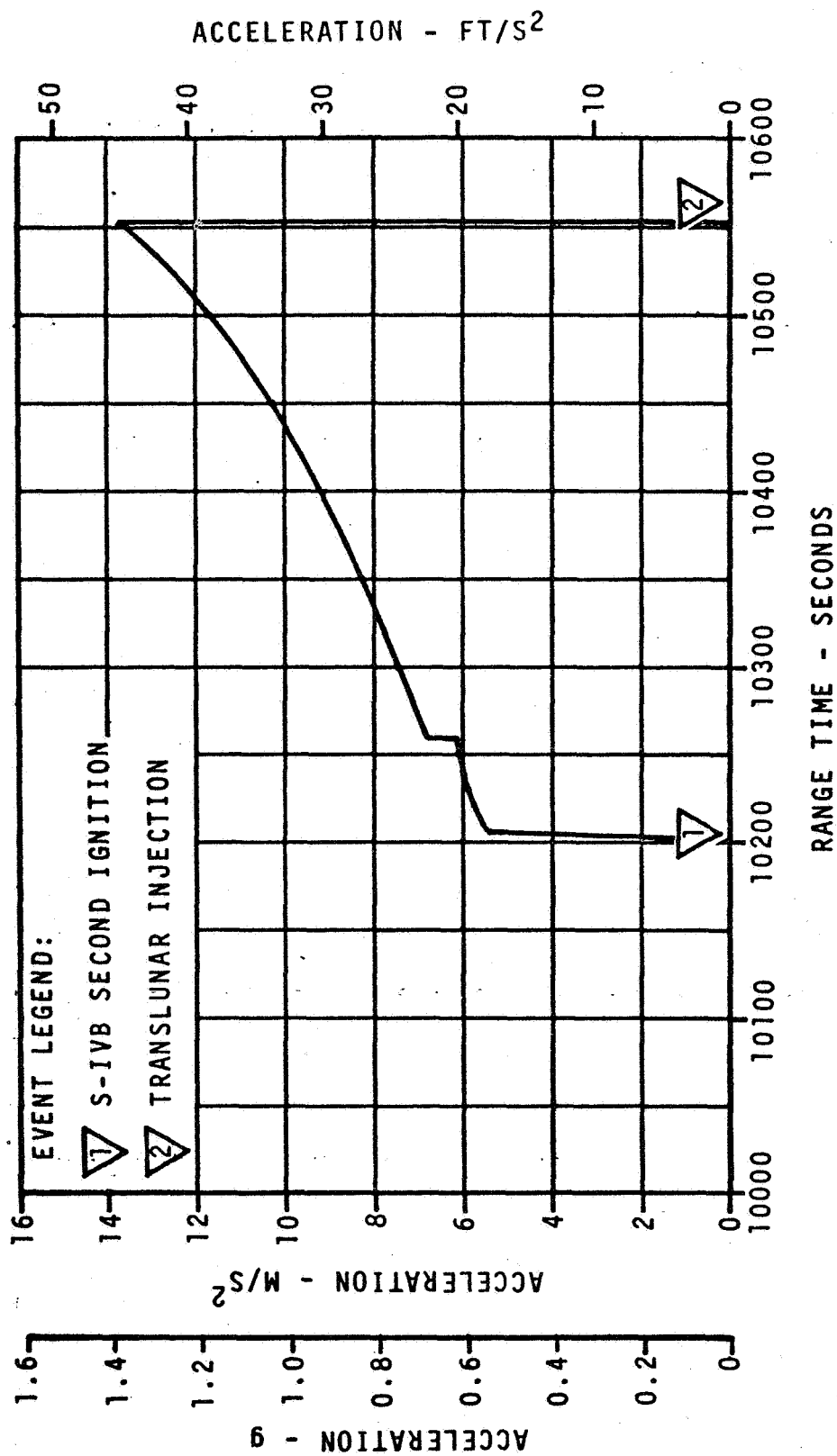


FIGURE 2-12. TOTAL INERTIAL ACCELERATION - SECOND BURN PHASE

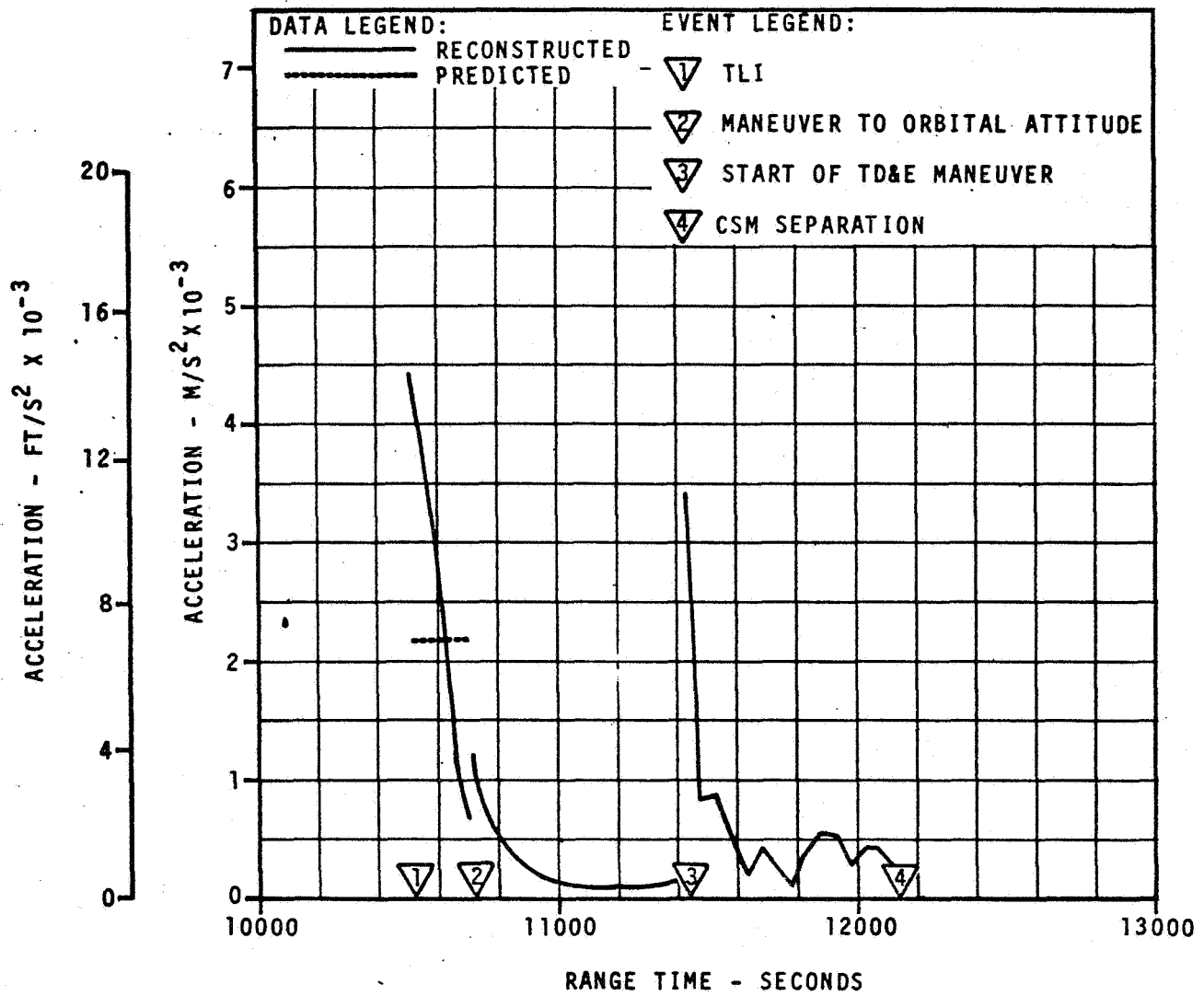


FIGURE 2-13. TRANSLUNAR ORBIT ACCELERATION

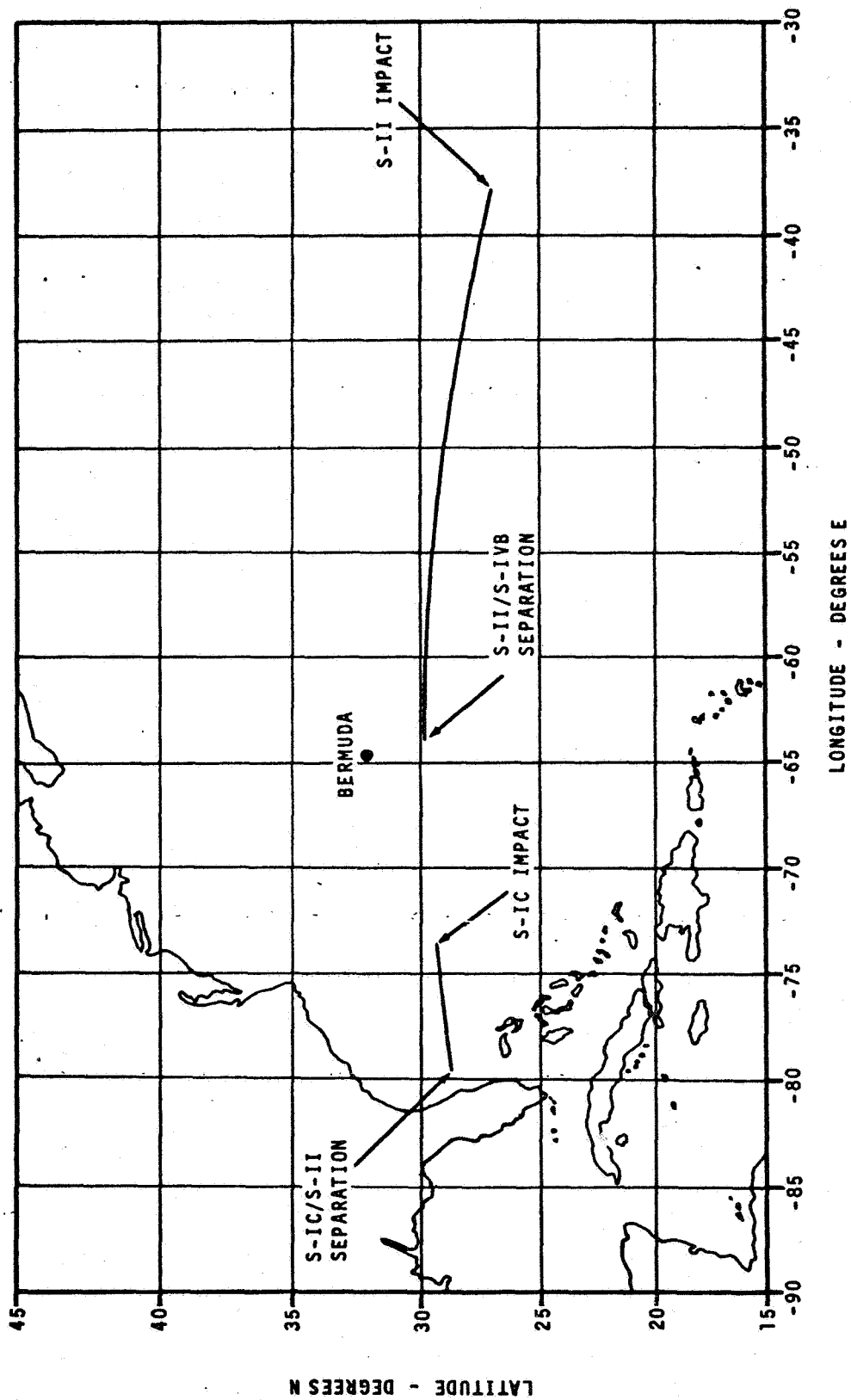


FIGURE 2-14. GROUND TRACKS FOR S-IC AND S-II SPENT STAGES



TABLE 2-I. TIMES OF SIGNIFICANT EVENTS

EVENT	RANGE TIME, SECONDS		
	ACTUAL	NOMINAL	ACT-NOM
Guidance Reference Release	-16.939	-16.980	0.041
First Motion	0.3	0.3	0.0
Start of Timebase 1	0.6	0.7	-0.1
Mach 1	65.0	64.4	0.6
Maximum Dynamic Pressure	82.0	80.3	1.7
S-IC Center Engine Cutoff	135.96	136.07	-0.11
S-IC Outboard Engine Cutoff	159.56	159.03	0.53
S-IC/S-II Separation Command	161.2	160.7	0.5
S-II Center Engine Cutoff	459.56	459.04	0.52
S-II Outboard Engine Cutoff	549.06	549.70	-0.64
S-II/S-IVB Separation Command	550.1	550.7	-0.6
S-IVB First Guidance Cutoff	694.67	699.06	-4.39
Parking Orbit Insertion	704.67	709.06	-4.39
Begin S-IVB Restart Preparations	9,624.8	9,618.6	6.2
S-IVB Engine Reignition (STDV Open)	10,202.9	10,196.6	6.3
S-IVB Second Guidance Cutoff	10,553.61	10,552.73	0.88
Translunar Injection	10,563.61	10,562.73	0.88
CSM Separation (Initial)	12,147.2	12,052.9	94.3

NOTE: TIMES USED ARE VEHICLE TIMES

TABLE 2-II. SIGNIFICANT TRAJECTORY PARAMETERS

EVENT	PARAMETER	VALUE
First Motion	Range Time, sec	0.3
	Total Inertial Acceleration, $\text{m/s}^2$ ( $\text{ft/s}^2$ ) (g)	10.61 (34.81) (1.08)
Mach 1	Range Time, sec	65.0
	Altitude, km (n mi)	7.8 (4.2)
Maximum Dynamic Pressure	Range Time, sec	82.0
	Dynamic Pressure, $\text{N/cm}^2$ ( $\text{lbf/ft}^2$ )	3.68 (768.58)
	Altitude, km (n mi)	13.7 (7.4)
Maximum Total Inertial Acceleration:	S-IC	
	Range Time, sec	159.56
	Acceleration, $\text{m/s}^2$ ( $\text{ft/s}^2$ ) (g)	38.97 (127.85) (3.97)
	S-II	
	Range Time, sec	459.56
	Acceleration, $\text{m/s}^2$ ( $\text{ft/s}^2$ ) (g)	17.55 (57.58) (1.79)
	S-IVB 1st Burn	
	Range Time, sec	694.67
	Acceleration, $\text{m/s}^2$ ( $\text{ft/s}^2$ ) (g)	6.40 (21.00) (0.65)
	S-IVB 2nd Burn	
	Range Time, sec	10,553.61
	Acceleration, $\text{m/s}^2$ ( $\text{ft/s}^2$ ) (g)	13.72 (45.01) (1.40)
Maximum Earth-Fixed Velocity:	S-IC	
	Range Time, sec	160.00
	Velocity, m/s (ft/s)	2,388.9 (7,387.6)
	S-II	
	Range Time, sec	550.00
	Velocity, m/s (ft/s)	6,584.1 (21,601.4)
	S-IVB 1st Burn	
	Range Time, sec	704.67
	Velocity, m/s (ft/s)	7,389.1 (24,242.5)
	S-IVB 2nd Burn	
	Range Time, sec	10,554.00
	Velocity, m/s (ft/s)	10,435.4 (34,236.9)

TABLE 2-III. ENGINE CUTOFF CONDITIONS

PARAMETER	S-IC CECO	S-IC OECO	S-II CECO	S-II OECO	S-IVB FIRST GUIDANCE CUTOFF	S-IVB SECOND GUIDANCE CUTOFF
Range Time, sec	135.96	159.56	459.56	549.06	694.67	10,553.61
Altitude, km (n mi)	46.8 (25.3)	68.4 (36.9)	178.2 (96.2)	176.3 (95.2)	172.6 (93.2)	308.0 (166.3)
Space Fixed Velocity, m/s (ft/s)	2,044.7 (6,708.3)	2,756.4 (9,043.3)	5,713.4 (18,744.8)	6,995.0 (22,949.5)	7,801.9 (25,596.8)	10,851.8 (35,603.0)
Flight Path Angle, deg	24.217	21.266	-0.285	0.059	0.013	6.975
Heading Angle, deg	82.494	82.129	87.150	89.863	95.149	72.767
Surface Range, km (n mi)	48.1 (26.0)	90.0 (48.6)	1,103.8 (596.0)	1,619.6 (874.5)	2,605.4 (1,406.8)	
Cross Range, km (n mi)	0.2 (0.1)	0.3 (0.2)	16.1 (8.7)	29.5 (15.9)	61.9 (33.4)	
Cross Range Velocity, m/s (ft/s)	3.9 (12.8)	6.8 (22.3)	121.6 (399.0)	181.4 (595.1)	265.8 (872.0)	
Inclination, deg						29.696
Decending Node, deg						108.439
Eccentricity						0.9746
*C <sub>3</sub> , m <sup>2</sup> /s <sup>2</sup> (ft <sup>2</sup> /s <sup>2</sup> )						-1,537,499 (-16,549,501)

\* Twice the specific energy of orbit

$$C_3 = V^2 - \frac{2\mu}{R}$$

Where V = Inertial Velocity

 $\mu$  = Gravitational Constant

R = Radius From Center of Earth

TABLE 2-IV. STAGE SEPARATION CONDITIONS

S-IC/S-II SEPARATION		S-II/S-IVB SEPARATION		S-IVB/CSM SEPARATION	
PARAMETER	VALUE	PARAMETER	VALUE	PARAMETER	VALUE
Range Time, sec	161.2	Range Time, sec	550.1	Range Time, sec	12,147.2
Altitude, km (n mi)	70.1 (37.9)	Altitude, km (n mi)	176.3 (95.2)	Altitude, km (n mi)	7,460.1 (4,028.1)
Space-Fixed Velocity, m/s (ft/s)	2,762.2 (9,062.3)	Space-Fixed Velocity, m/s (ft/s)	6,999.0 (22,962.6)	Space-Fixed Velocity, m/s (ft/s)	7,494.0 (24,586.6)
Flight Path Angle, deg	21.021	Flight Path Angle, deg	0.047	Flight Path Angle, deg	46.015
Heading Angle, deg	82.144	Heading Angle, deg	89.900	Heading Angle, deg	112.493
Surface Range, km (n mi)	93.5 (50.5)	Surface Range, km (n mi)	1,626.3 (878.1)	Geodetic Latitude, deg N	19.961
Cross Range, km (n mi)	0.3 (0.2)	Cross Range, km (n mi)	29.7 (16.0)	Longitude, deg E	-62.503
Cross Range Velocity, m/s (ft/s)	7.1 (23.3)	Cross Range Velocity, m/s (ft/s)	182.0 (597.1)		
Geodetic Latitude, deg N	28.748	Geodetic Latitude, deg N	29.843		
Longitude, deg E	-79.661	Longitude, deg E	-63.922		

NOTE: Times used are vehicle times.

TABLE 2-V. PARKING ORBIT INSERTION CONDITIONS AND COMPARISONS

PARAMETER	ACTUAL	NOMINAL	ACT-NOM
Range Time, sec	704.67	709.06	-4.39
Altitude, km (n mi)	172.6 (93.2)	171.8 (92.8)	0.8 (0.4)
Space-Fixed Velocity, m/s (ft/s)	7,803.7 (25,602.7)	7,804.0 (25,603.7)	-0.3 (-1.0)
Flight Path Angle, deg	0.015	0.000	0.015
Heading Angle, deg	95.531	95.674	-0.143
Inclination, deg	29.679	29.685	-0.006
Descending Node, deg	109.314	109.330	-0.016
Eccentricity	0.0003	0.0000	0.0003
Apogee*, km (n mi)	169.5 (91.5)	166.7 (90.0)	2.8 (1.5)
Perigee*, km (n mi)	166.0 (89.6)	166.5 (89.9)	-0.5 (-0.3)
Period, min	87.84	87.82	0.02
Geodetic Latitude, deg N	29.365	29.346	0.019
Longitude, deg E	-53.081	-52.791	-0.290

NOTE: Range Times used are times of occurrence at the vehicle.

\*Based on a spherical earth of radius 6,378.165 km (3,443.934 n mi).

TABLE 2-VI. PARKING ORBIT ACCELERATION POLYNOMIALS

SEG. NO.	START TIME	END TIME	$C_0$	$C_1$	$C_2$	$C_3$	$C_4$	$C_5$
X1	704.67	795.00	$-.814632 \times 10^{-5}$	$.714735 \times 10^{-6}$	$-.208285 \times 10^{-7}$	$.201282 \times 10^{-9}$	$-.334805 \times 10^{-12}$	$-.239857 \times 10^{-14}$
X2	795.00	9,615.00	$-.764246 \times 10^{-6}$	$-.250846 \times 10^{-8}$	$.253598 \times 10^{-11}$	$-.787176 \times 10^{-15}$	$.980020 \times 10^{-19}$	$-.427115 \times 10^{-23}$
X3	9,615.00	10,200.00	$.357024 \times 10^{-6}$	$-.286982 \times 10^{-8}$	$.122456 \times 10^{-10}$	$.951775 \times 10^{-13}$	$-.559225 \times 10^{-15}$	$.715444 \times 10^{-18}$
Y1	704.67	10,200.00	.0	.0	.0	.0	.0	.0
Z1	704.67	795.00	$.918868 \times 10^{-5}$	$-.752550 \times 10^{-6}$	$.359357 \times 10^{-7}$	$-.666337 \times 10^{-9}$	$.504612 \times 10^{-11}$	$-.129903 \times 10^{-13}$
Z2	795.00	9,615.00	$.174480 \times 10^{-5}$	$-.294140 \times 10^{-8}$	$.104884 \times 10^{-11}$	$-.676060 \times 10^{-16}$	$-.139041 \times 10^{-19}$	$.140876 \times 10^{-23}$
Z3	9,615.00	10,200.00	$.886491 \times 10^{-7}$	$.126377 \times 10^{-7}$	$-.175800 \times 10^{-9}$	$.100010 \times 10^{-11}$	$-.240915 \times 10^{-14}$	$.205784 \times 10^{-17}$

POLYNOMIAL MODEL  
ACCELERATION BIAS TERMS

$$X = .289124 \times 10^{-6}$$

$$Y = .114394 \times 10^{-7}$$

$$Z = -.941890 \times 10^{-7}$$

POLYNOMIALS ARE OF THE FORM  $A = C_0 + C_1 t + C_2 t^2 + C_3 t^3 + C_4 t^4 + C_5 t^5$

WHERE A IS THE ACCELERATION COMPONENT (KM/SEC<sup>2</sup>) AND  $t = T - T_S$  WHERE  $T_S < T_E$

THE START TIME ( $T_S$ ) AND END TIME ( $T_E$ ) FOR EACH SEGMENT ARE EXPRESSED IN SECONDS RANGE TIME

THE ACCELERATION COMPONENTS ARE EXPRESSED IN THE LAUNCH VEHICLE PLATFORM - ACCELEROMETER SYSTEM (PACSS12).

TABLE 2-VII. TRANSLUNAR INJECTION CONDITIONS AND COMPARISONS

PARAMETER	ACTUAL	NOMINAL	ACT-NOM
Range Time, sec	10,563.61	10,562.73	0.88
Altitude, km (n mi)	321.7 (173.7)	324.8 (175.4)	-3.1 (-1.7)
Space Fixed Velocity, m/s (ft/s)	10,844.5 (35,579.1)	10,842.3 (35,571.9)	2.2 (7.2)
Flight Path Angle, deg	7.430	7.596	-0.166
Heading Angle	73.173	73.338	-0.165
Inclination, deg	29.696	29.696	0.000
Descending Node, deg	108.439	108.452	-0.013
Eccentricity	0.9760	0.9761	-0.0001
$C_3$ , $\frac{m^2}{s^2}$ ( $\frac{ft^2}{s^2}$ )	-1,453,369 (-15,643,934)	-1,445,581 (-15,560,104)	-7,788 (-83,829)

TABLE 2-VIII. TRANSUNAR ORBIT ACCELERATION POLYNOMIALS

SEG. NO.	START TIME	END TIME	$C_0$	$C_1$	$C_2$	$C_3$	$C_4$	$C_5$
X1	10,563.61	10,705.00	.939663X10 <sup>-6</sup>	-.413031X10 <sup>-8</sup>	.0	.0	.0	.0
X2	10,705.00	11,443.00	.139479X10 <sup>-5</sup>	-.504178X10 <sup>-7</sup>	.383003X10 <sup>-9</sup>	-.119203X10 <sup>-11</sup>	.164268X10 <sup>-14</sup>	-.831641X10 <sup>-18</sup>
X3	11,443.00	12,547.20	-.221664X10 <sup>-5</sup>	.546512X10 <sup>-7</sup>	-.447051X10 <sup>-9</sup>	.150996X10 <sup>-11</sup>	-.223050X10 <sup>-14</sup>	.119545X10 <sup>-17</sup>
Y1	10,563.61	11,443.00	.0	.0	.0	.0	.0	.0
Y2	11,443.00	12,547.20	.256912X10 <sup>-5</sup>	-.767826X10 <sup>-7</sup>	.648024X10 <sup>-9</sup>	-.223635X10 <sup>-11</sup>	.335647X10 <sup>-14</sup>	-.181817X10 <sup>-17</sup>
Z1	10,563.61	10,705.00	.432790X10 <sup>-5</sup>	-.358533X10 <sup>-7</sup>	.126672X10 <sup>-10</sup>	.0	.0	.0
Z2	10,705.00	11,443.00	.138035X10 <sup>-6</sup>	.785952X10 <sup>-10</sup>	-.143279X10 <sup>-12</sup>	.0	.0	.0
Z3	11,443.00	12,547.20	-.107709X10 <sup>-5</sup>	.676887X10 <sup>-8</sup>	.141484X10 <sup>-11</sup>	-.873579X10 <sup>-13</sup>	.212500X10 <sup>-15</sup>	-.152518X10 <sup>-18</sup>

POLYNOMIAL MODEL  
ACCELERATION BIAS TERMS

$$X = .289124X10^{-6}$$

$$Y = .114394X10^{-7}$$

$$Z = -.941890X10^{-7}$$

POLYNOMIALS ARE OF THE FORM  $A + C_0 + C_1t + C_2t^2 + C_3t^3 + C_4t^4 + C_5t^5$

WHERE A IS THE ACCELERATION COMPONENT (KM/SEC<sup>2</sup>) AND  $t = T - T_S$  WHERE  $T_S \leq t \leq T_E$

THE START TIME ( $T_S$ ) AND END TIME ( $T_E$ ) FOR EACH SEGMENT ARE EXPRESSED IN SECONDS RANGE TIME

THE ACCELERATION COMPONENTS ARE EXPRESSED IN THE LAUNCH VEHICLE PLATFORM -  
ACCELEROMETER SYSTEM (PACSS12).



TABLE 2-IX. CSM SEPARATION CONDITIONS

PARAMETER	VALUE
Range Time, sec	12,147.2
Altitude, km (n mi)	7,460.1 (4,028.1)
Space Fixed Velocity, m/s (ft/s)	7,494.0 (24,586.6)
Flight Path Angle, deg	46.015
Heading Angle, deg	112.493
Geodetic Latitude, deg N	19.961
Longitude, deg E	297.497

TABLE 2-X. S-IC SPENT STAGE TRAJECTORY PARAMETERS

EVENT	PARAMETER	VALUE
Impact: Tumbling Case	Range Time, sec	560.839
	Latitude, deg N	29.420
	Longitude, deg W	73.653
	Surface Range, km (n mi)	683.1 368.8
Impact: 0° Angle-of-Attack	Range Time, sec	519.912
	Latitude, deg N	29.427
	Longitude, deg W	73.568
	Surface Range, km (n mi)	691.3 373.3
Impact: 90° Angle-of-Attack	Range Time, sec	595.580
	Latitude, deg N	29.416
	Longitude, deg W	73.709
	Surface Range, km (n mi)	677.6 365.9
Apex: Tumbling Case	Range Time, sec	277.562
	Altitude, km (n mi)	127.4 68.8
	Surface Range, km (n mi)	338.8 182.9

TABLE 2-XI. S-II SPENT STAGE TRAJECTORY PARAMETERS

EVENT	PARAMETER	VALUE
Impact: Tumbling Case	Range Time, sec	1,183.912
	Latitude, deg N	26.975
	Longitude, deg W	37.924
	Surface Range, km (n mi)	4,188.0 2,261.3
Impact: 0° Angle-of-Attack	Range Time, sec	1,149.900
	Latitude, deg N	26.914
	Longitude, deg W	37.650
	Surface Range, km (n mi)	4,216.0 2,276.5
Impact: 90° Angle-of-Attack	Range Time, sec	1,223.316
	Latitude, deg N	27.038
	Longitude, deg W	38.206
	Surface Range, km (n mi)	4,159.1 2,245.7
Apex: Tumbling Case	Range Time, sec	553.225
	Altitude, km	176.3
	(n mi)	95.2
	Surface Range, km (n mi)	1,646.3 888.9

## SECTION 3

## TRAJECTORY ACCURACY

Trajectory reconstruction is an estimation process with the resulting confidence level or accuracy of the trajectory dependent upon the following factors:

- a. Quantity of tracking data
- b. Quality of tracking data
- c. Consistency between tracking and guidance velocity data
- d. Continuity between trajectory phases (boost, parking orbit, second burn, and translunar orbit)

These factors vary from flight to flight so that a rigorous statistical error analysis of the reconstructed trajectory is difficult to obtain. However, the extent to which systematic errors can be identified and corrected, plus random errors averaged out, determines the accuracy of the reconstruction. This section summarizes the results for the AS-510 flight and leads to the position and velocity uncertainties for the reconstructed trajectory. In addition, the basic analysis methods used in the reconstruction are presented in this section.

## 3.1 TRAJECTORY RECONSTRUCTION METHODS

After initial data processing is completed, consisting of independent and dependent variable editing plus refraction corrections, as required, two different basic analysis programs are used to reconstruct the AS-510 trajectory. These two programs are first used to analyze orbit phases and powered flight phases separately. Then the phases are combined and merged together to produce the complete AS-510 trajectory. Included in the merging process is a rework of the first 20 seconds of the ascent phase to better represent the early launch portion of the trajectory. Also, the transient areas of the powered flight portions of the trajectory are reshaped in order to better represent engine start, cutoff, and mixture ratio shift conditions.

## 3.1.1 Orbit Analysis Method

The Orbit Correction Program (OCP) uses a weighted-least-squares method to fit tracking data and determine the coasting phases of the trajectory. A comprehensive orbital model, including perturbing accelerations such as venting, is used to simulate the trajectory. Differential corrections are generally applied to initial vehicle position and velocity

### 3.1.1 (Continued)

parameters as well as the constant terms in the polynomials used to model the perturbing accelerations. These corrections are based upon the residual differences between the tracking data and the simulated trajectory. The OCP program can, if necessary, correct for other parameters such as station locations, physical constants, etc., but these capabilities have seldom been required.

After all available tracking data are analyzed in conjunction with the acceleration model developed from vehicle data, the tracking stations and passes providing the better quality data which are most consistent are used to determine the insertion/injection conditions and polynomial biases.

### 3.1.2 Powered Flight Analysis Method

The Guidance and Tracking Evaluation (GATE) program uses a Kalman least-squares recursive estimation scheme to determine the powered flight phases of the trajectory. Telemetered guidance velocity data from on board the vehicle are used as generating parameters in conjunction with a comprehensive earth gravitational model to produce a trajectory to fit the available tracking data. The Kalman estimation scheme solves for initial position and velocity corrections plus changes in initial estimates of the coefficients of an error model of the guidance system. In addition, the trajectory can be constrained to some arbitrary position and velocity at some specified time. This feature is used in combining the different trajectory phases together to produce a continuous trajectory. The GATE program can also be used to solve for C-Band tracking error model coefficients. This feature is only used when it is deemed necessary to resolve tracking data inconsistencies in reconstructing the trajectory.

After all the available tracking data are analyzed, the tracking data which are most consistent are used to determine the guidance error coefficients and, if required, the initial conditions.

## 3.2 TRAJECTORY DATA SOURCES

### 3.2.1 Tracking Data - Quantity

Time periods for which C-Band radar and S-Band tracking data were available for AS-510 reconstruction are illustrated in Figure 3-1. The geographic locations of the tracking stations are shown on ground track Figures 2-1 and 2-8 and are itemized in Table 3-I. All of the tracking data was used except for isolated points or for data segments which were inconsistent with adjacent data.

### 3.2.1 (Continued)

The C-Band tracking data were provided in azimuth angle, elevation angle, and slant range measured parameters. These measurements are defined in Reference 1 and are designated as PACSS 3a. The USB tracking data were provided in X-angle, Y-angle, range, and range rate measured parameters. These parameters are defined in Reference 1 and are designated as PACSS 3c.

As can be noted in Figure 3-1, adequate data existed in order to determine the AS-510 trajectory. In general, tracking coverage was redundant except for the second burn phase which was partially observed by the one Hawaii S-Band tracker.

### 3.2.2 Tracking Data - Quality

Measured parameter comparisons between the tracking data and the trajectory phases were calculated in PACSS 3a and PACSS 3c. The position components of the trajectory in PACSS 10 were transformed into the measured parameters of PACSS 3a and PACSS 3c. Residual differences or deviations (observed tracking data minus calculated tracking data, O-C) were determined for the various tracking data sets. These residual differences are used for assessing the quality of the tracking data as well as determining how well the reconstructed trajectory fits the data.

Measured parameter residuals during the ascent phase for the five C-Band radars are shown in Figures 3-2 through 3-4. Azimuth residuals are plotted in Figure 3-2, elevation in 3-3, and slant range in 3-4. Residuals for the Bermuda S-Band tracker used in the solution are shown in Figure 3-5.

Measured parameter residuals during the parking orbit phase are given in Figures 3-6 through 3-13. Figures 3-6 and 3-7 show the 1st pass Bermuda C-Band radar azimuth, elevation and range residuals, Figures 3-8 and 3-9 show the corresponding 2nd pass MILA and Bermuda C-Band residuals and Figures 3-10 and 3-11 show the similar residuals for the 1st and 2nd pass Carnarvon C-Band radar. Figures 3-12 and 3-13 show the Merritt Island and Texas S-Band tracker residuals for the parameters used in the reconstruction.

The second burn phase Hawaii S-Band measured parameter residuals are shown in Figure 3-14.

The translunar phase measured parameter residuals are given in Figures 3-15, 3-16, and 3-17. Figures 3-15 and 3-16 show

### 3.2.2 (Continued)

the Bermuda and Merritt Island C-Band residuals. Figure 3-17 shows the range-rate residuals for the Madrid Wing, Texas and Goldstone Wing S-Band trackers. The other measured parameters for the S-Band stations were not used in the reconstruction.

As can be noted in these measured parameter residuals, excellent fits were achieved for the different C-Band and S-Band trackers throughout the various trajectory phases. The plots also show the data used in the trajectory reconstruction to be mutually consistent.

### 3.2.3 Guidance Velocity Data

Guidance velocity data throughout the separate trajectory phases were received from the ST-124M inertial platform. The velocity data during the powered phases (ascent and second burn) were used directly by the GATE program as non-gravitational generating parameters. Velocity data during the orbit phases (parking and translunar) were fitted with polynomials and used in the OCP program to provide non-gravitational acceleration effects. (See Paragraphs 2.2 and 2.4 plus Figures 2-9 and 2-13.)

## 3.3 CONSISTENCY BETWEEN TRACKING AND GUIDANCE VELOCITY DATA

The consistency between tracking and guidance velocity data can be obtained by examining guidance velocity error plots during powered flight trajectory segments. These error plots give the differences between the guidance velocities from the ST-124M platform and those derived from the reconstructed trajectory which fit the tracking data.

The guidance velocity error plots for the ascent phase had reasonable shapes and magnitudes. The maximum error amounted to 1.6 m/s (5.2 ft/s) in the vertical direction, 1.5 m/s (4.9 ft/s) in the crossrange direction, and 0.4 m/s (1.3 ft/s) in the downrange direction, referenced to the launch vehicle platform accelerometer coordinate system (PACSS12).

The guidance velocity error plots for the second burn phase also had reasonable shapes and magnitudes. The maximum error amounted to 1.3 m/s (4.3 ft/s) in the vertical direction, 0.8 m/s (2.6 ft/s) in the crossrange direction, and 1.0 m/s (3.3 ft/s) in the downrange direction, referenced to PACSS12.

### 3.4 CONTINUITY BETWEEN TRAJECTORY PHASES

The continuity between trajectory segments can be obtained by examining the insertion and injection parameters determined by the orbital and powered flight solutions before the trajectory segments are merged together.

Comparisons of the state vectors at parking orbit insertion obtained independently by the powered flight and parking orbit analyses yielded good agreement. The position and velocity components of the solutions had a spread of 52 m (171 ft) and 0.7 m/s (2.3 ft/s) in the vertical direction, 74 m (243 ft) and 0.2 m/s (0.7 ft/s) in the crossrange direction, and 32 m (105 ft) and 0.4 m/s (1.3 ft/s) in the downrange direction, referenced to the earth-fixed launch site coordinate system (PACSS10). Since these differences are small, the ascent phase was combined exactly to the parking orbit phase at insertion in order to make the trajectory continuous. This exact combine caused small warps in the measured parameter range residuals (see Figures 3-4 and 3-5).

Comparisons of the translunar injection (TLI) vectors determined independently from the second burn and translunar analyses also yielded good agreement. The TLI vector from the second burn analysis was obtained by fitting the Hawaii S-Band tracking data and solving for the coefficients of the guidance error model plus initial state vector changes at 10,010 seconds. These corrections were then used in a GATE simulation through the second burn to TLI.

The initial state vector was obtained from the parking orbit at a time point near the beginning of the guidance velocity data obtained for the second burn phase. Changes in this vector were allowed because of the uncertainty in the parking orbit phase. These changes were 409 m (1342 ft) and 0 m/s (0 ft/s) in the vertical direction, 2 m (7 ft) and 1.2 m/s (3.9 ft/s) in the crossrange direction, and 450 m (1476 ft) and 3.6 m/s (11.8 ft/s) in the downrange direction, referenced to the PACSS10 system. These component changes represent a change of 750 m (2461 ft) in the magnitude of the radius vector and 0.3 m/sec (1.0 ft/s) in the magnitude of the velocity vector referenced to PACSS10.

The position and velocity components of the two independent solutions at TLI had respectively a difference of 1085 m (3560 ft) and 0.2 m/s (0.7 ft/s) in the vertical direction, 657 m (2155 ft) and 3.4 m/s (11.2 ft/s) in the crossrange direction, and 693 m (2273 ft) and 2.2 m/s (7.2 ft/s) in the downrange direction, referenced to the PACSS10 system.



### 3.4 (Continued)

These component changes represent a change of 1400 m (4593 ft) in the magnitude of the radius vector and 1.7 m/s (5.6 ft/s) in the magnitude of the velocity vector referenced to PACSS10. Since the post-TLI tracking data did not begin until 423 seconds following TLI, the second burn phase was used to provide the translunar injection conditions and was not combined to the translunar phase.

Additional comparisons were performed for the translunar trajectory by selecting various tracking data combinations and solving for injection conditions. The TLI vectors resulting from a set of solutions had position and velocity component differences in PACSS10 of 954 m (3130 ft) and 1.3 m/s (4.3 ft/s) in the vertical direction, 558 m (1831 ft) and 1.6 m/s (5.2 ft/s) in the crossrange direction, and 93 m (305 ft) and 0.5 m/s (1.6 ft/s) in the downrange direction.

As an additional validity check on the translunar phase, the CSM separation state vector was propagated forward to lunar impact with various planned velocity increments modeled. The resultant lunar impact point is in excellent agreement with lunar impact points similarly determined by propagating forward Manned Spaceflight Center state vectors which were determined in real time during the AS-510 mission.

### 3.5 TRAJECTORY UNCERTAINTIES

As an additional aid in estimating the trajectory accuracy, some of the tracking data throughout the various trajectory phases were transformed into the earth-fixed launch site coordinate system (PACSS10) and differenced with the reconstructed trajectory. The resulting residuals or deviations provide a more direct indication of the spread of the tracking data about the trajectory and are plotted in Figures 3-18 through 3-29.

The position deviations during the ascent phase are shown for the C-Band trackers in Figures 3-18 through 3-21 with the Bermuda S-Band tracker deviations shown in Figure 3-22. Similarly, the position deviations for the parking orbit phase are shown for the C-Band trackers in Figures 3-23 through 3-26. The second burn phase deviations are shown for the Hawaii S-Band tracker in Figure 3-27. Finally, deviations for the C-Band trackers for the translunar phase are shown in Figures 3-28 and 3-29.

## 3.5 (Continued)

Based upon the information of the above paragraphs and a priori knowledge, the trajectory uncertainties were conservatively estimated. The uncertainties for the ascent phase are shown in Figure 3-30. At S-IC OECO, the uncertainties in position and velocity components in PACSS10 are  $\pm 70$  m ( $\pm 230$  ft) and  $\pm 0.4$  m/s ( $\pm 1.3$  ft/s), respectively. At S-II OECO, the uncertainties in position and velocity components in PACSS10 are  $\pm 360$  m ( $\pm 1,181$  ft) and  $\pm 0.7$  m/s ( $\pm 2.3$  ft/s), respectively. At insertion and throughout the parking orbit, the uncertainties in position and velocity components in PACSS10 are  $\pm 500$  m ( $\pm 1,640$  ft) and  $\pm 1.8$  m/s ( $\pm 5.9$  ft/s), respectively. The trajectory uncertainties increased to  $\pm 1,500$  m ( $\pm 4,921$  ft) in position components and  $\pm 2.0$  m/s ( $\pm 6.6$  ft/s) in velocity components at TLI and throughout the post-TLI trajectory. The total radius and velocity magnitude uncertainties throughout the parking orbit phase are estimated at  $\pm 300$  m ( $\pm 984$  ft) and  $\pm 0.5$  m/s ( $\pm 1.6$  ft/s). Similarly, the total radius and velocity magnitude uncertainties throughout the translunar orbit phase are estimated at  $\pm 1,000$  m ( $\pm 3,281$  ft) and  $\pm 1.0$  m/s ( $\pm 3.3$  ft/s).

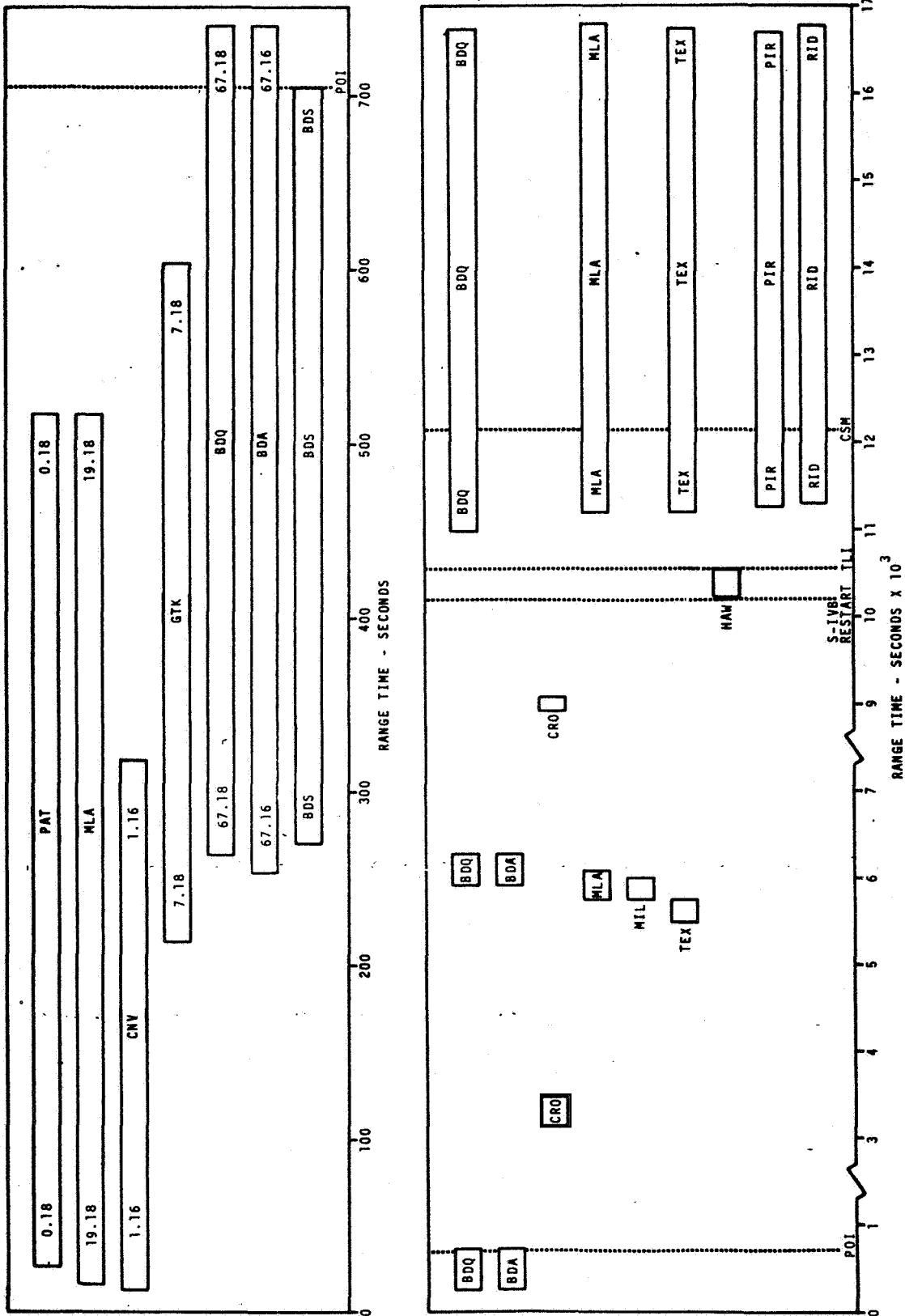


FIGURE 3-1 AS-510 TRACKING DATA COVERAGE

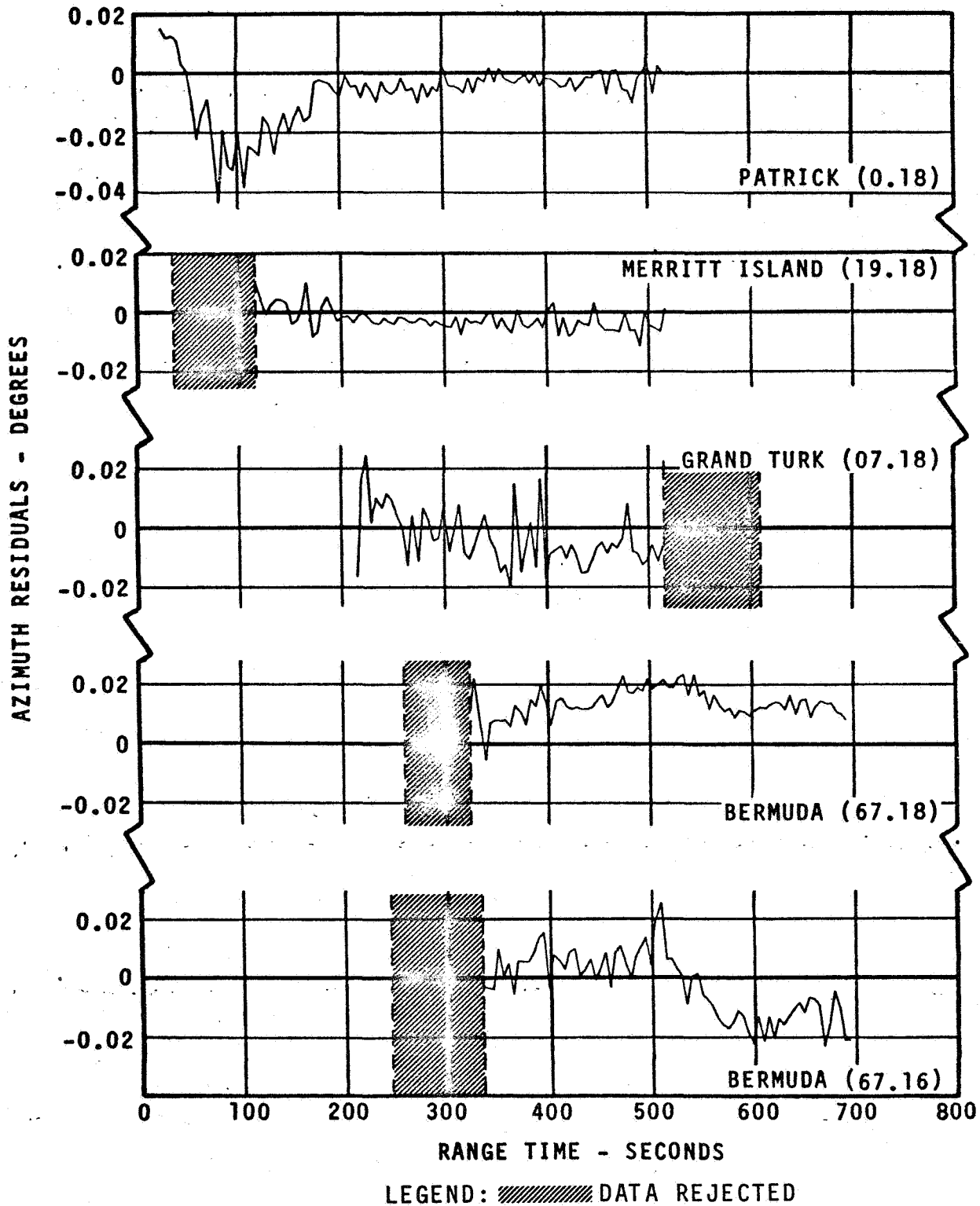


FIGURE 3-2. C-BAND RADAR AZIMUTH ANGLE TRACKING DEVIATIONS - ASCENT PHASE

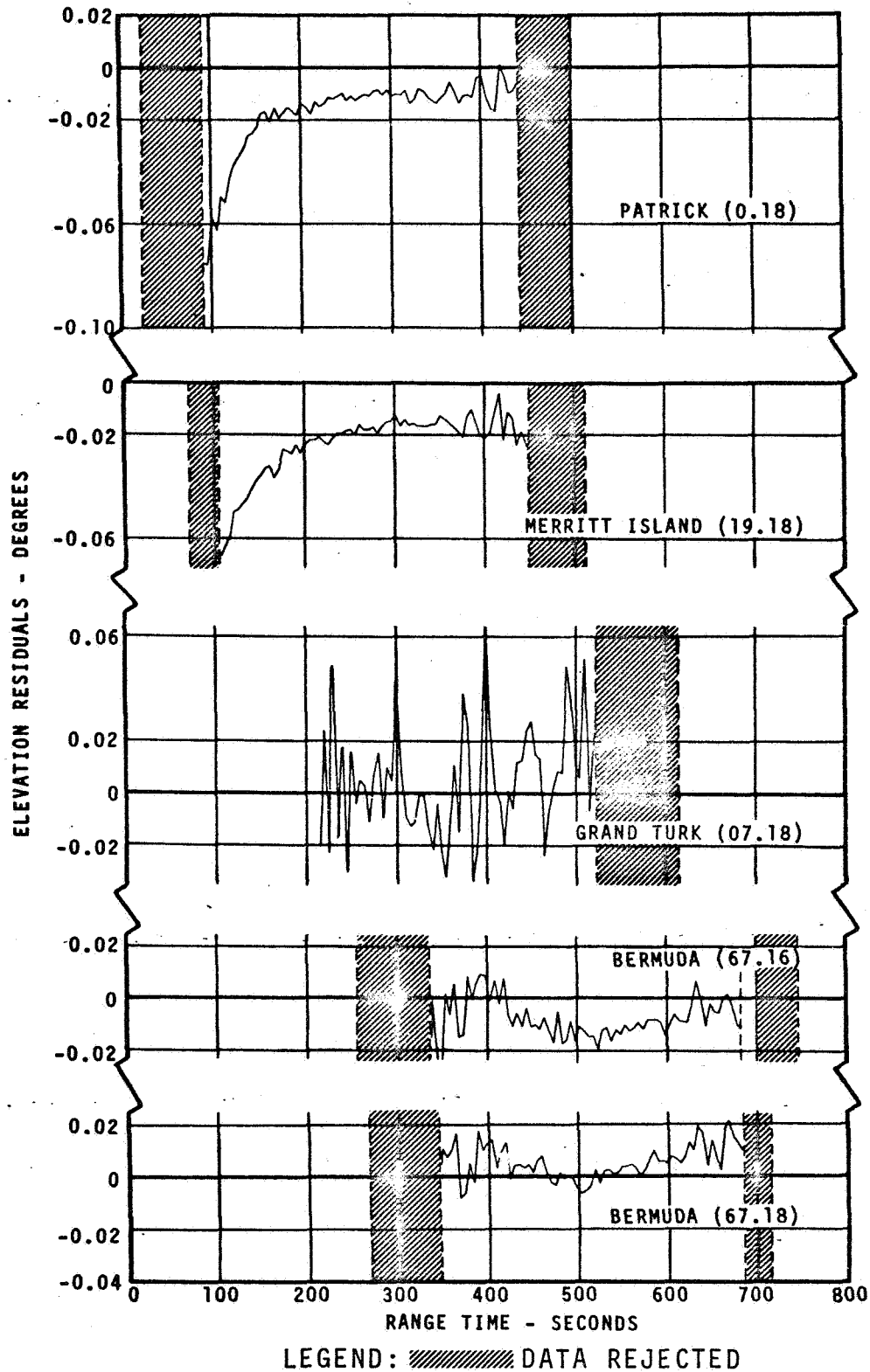


FIGURE 3-3. C-BAND RADAR ELEVATION ANGLE TRACKING DEVIATIONS - ASCENT PHASE

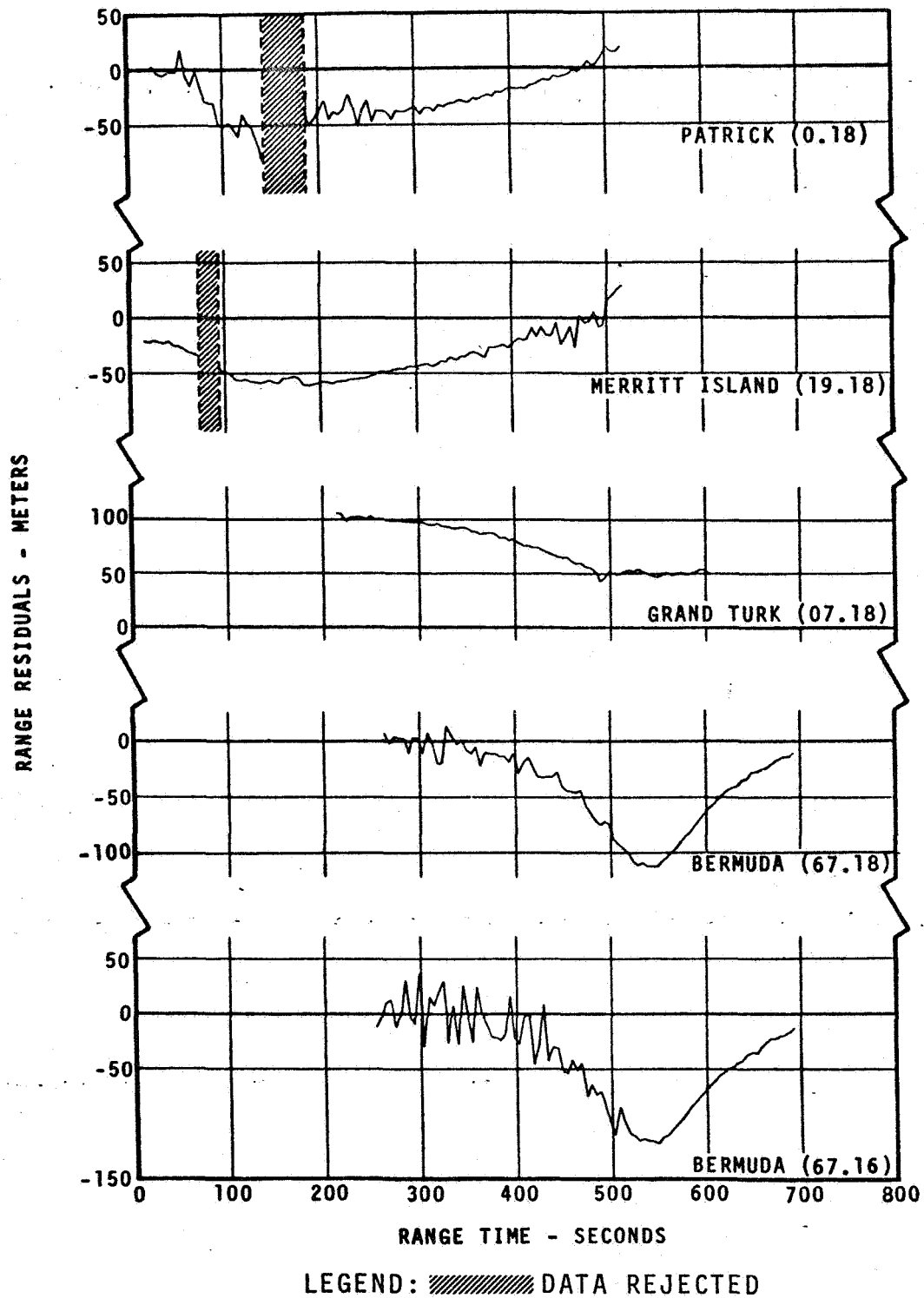


FIGURE 3-4. C-BAND RADAR SLANT RANGE TRACKING DEVIATIONS - ASCENT PHASE

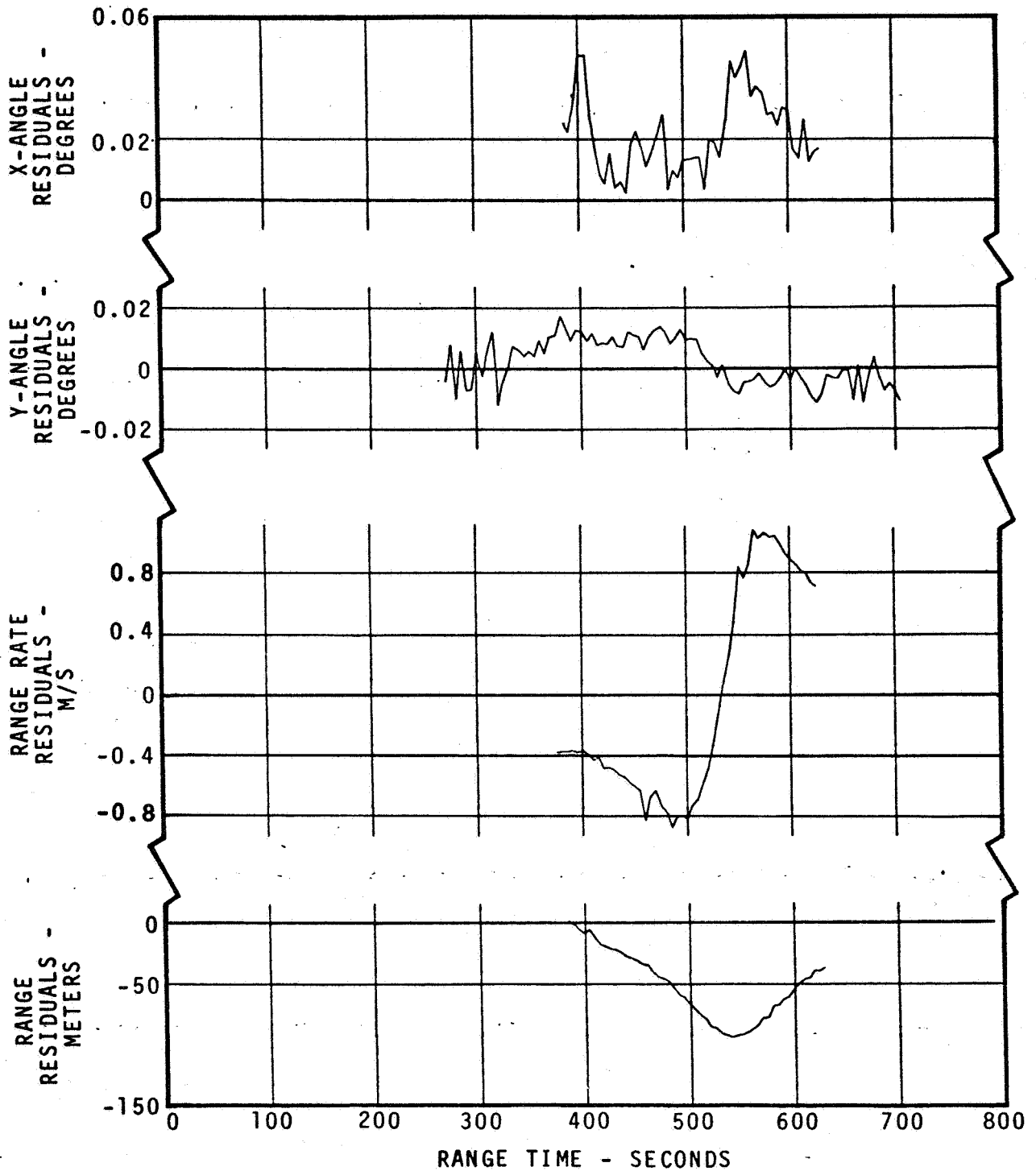


FIGURE 3-5. BERMUDA S-BAND TRACKING DEVIATIONS - ASCENT PHASE (BDS)

## BDA - FIRST PASS

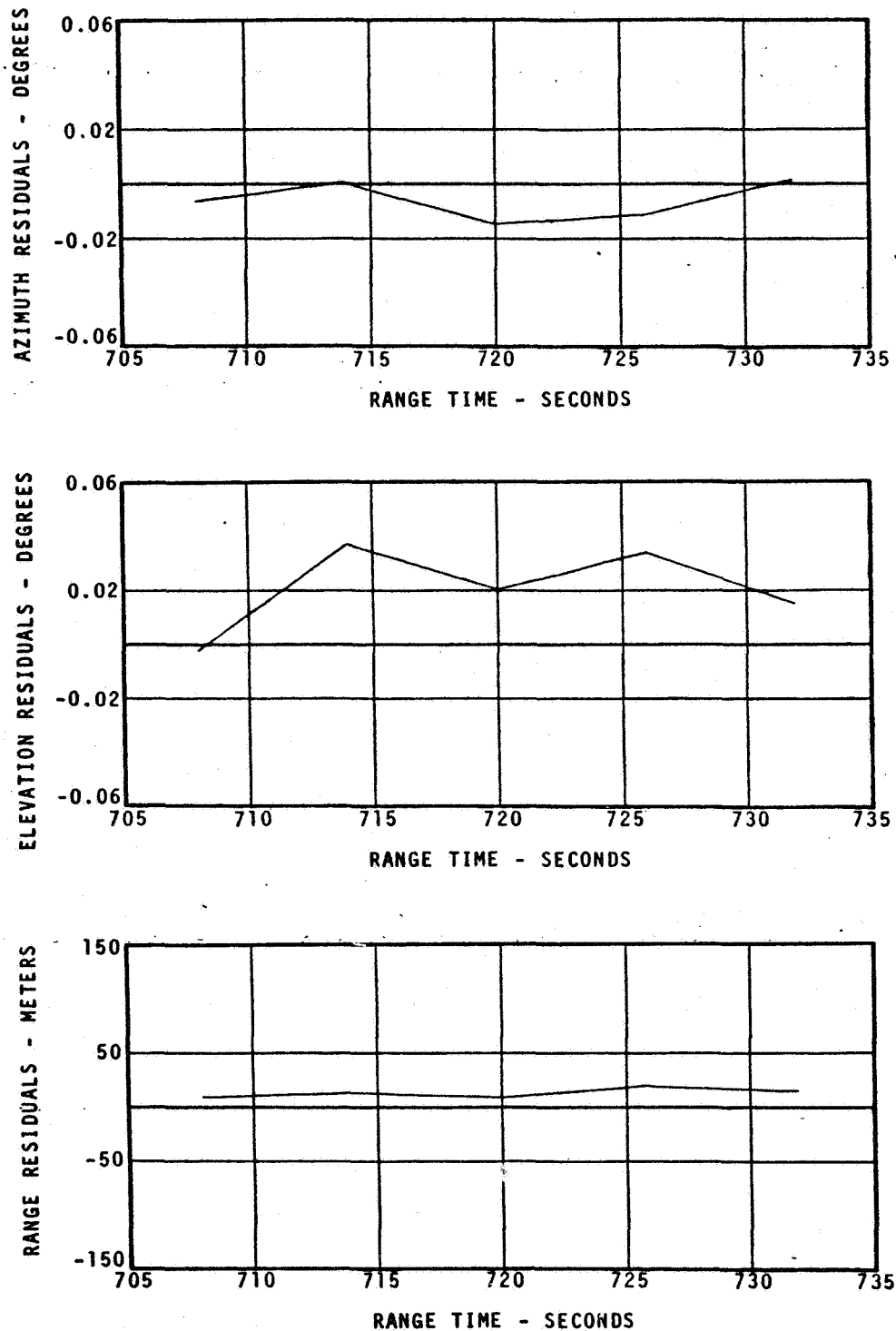


FIGURE 3-6. BERMUDA C-BAND RADAR TRACKING DEVIATIONS - PARKING ORBIT PHASE - REV. 1 (BDA)



## BDQ - FIRST PASS

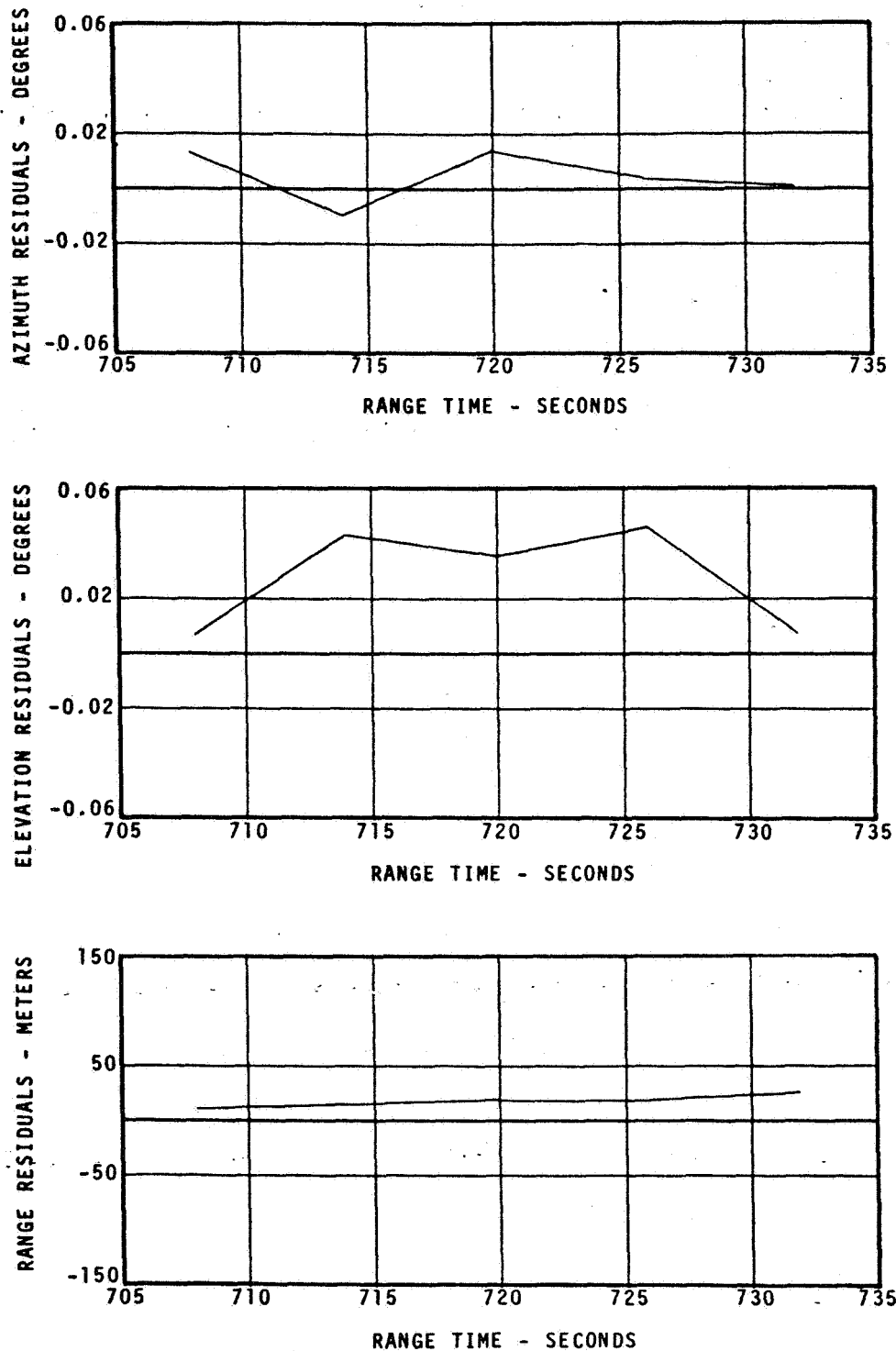


FIGURE 3-7. BERMUDA C-BAND RADAR TRACKING DEVIATIONS - PARKING ORBIT PHASE - REV. 1 (BDQ)

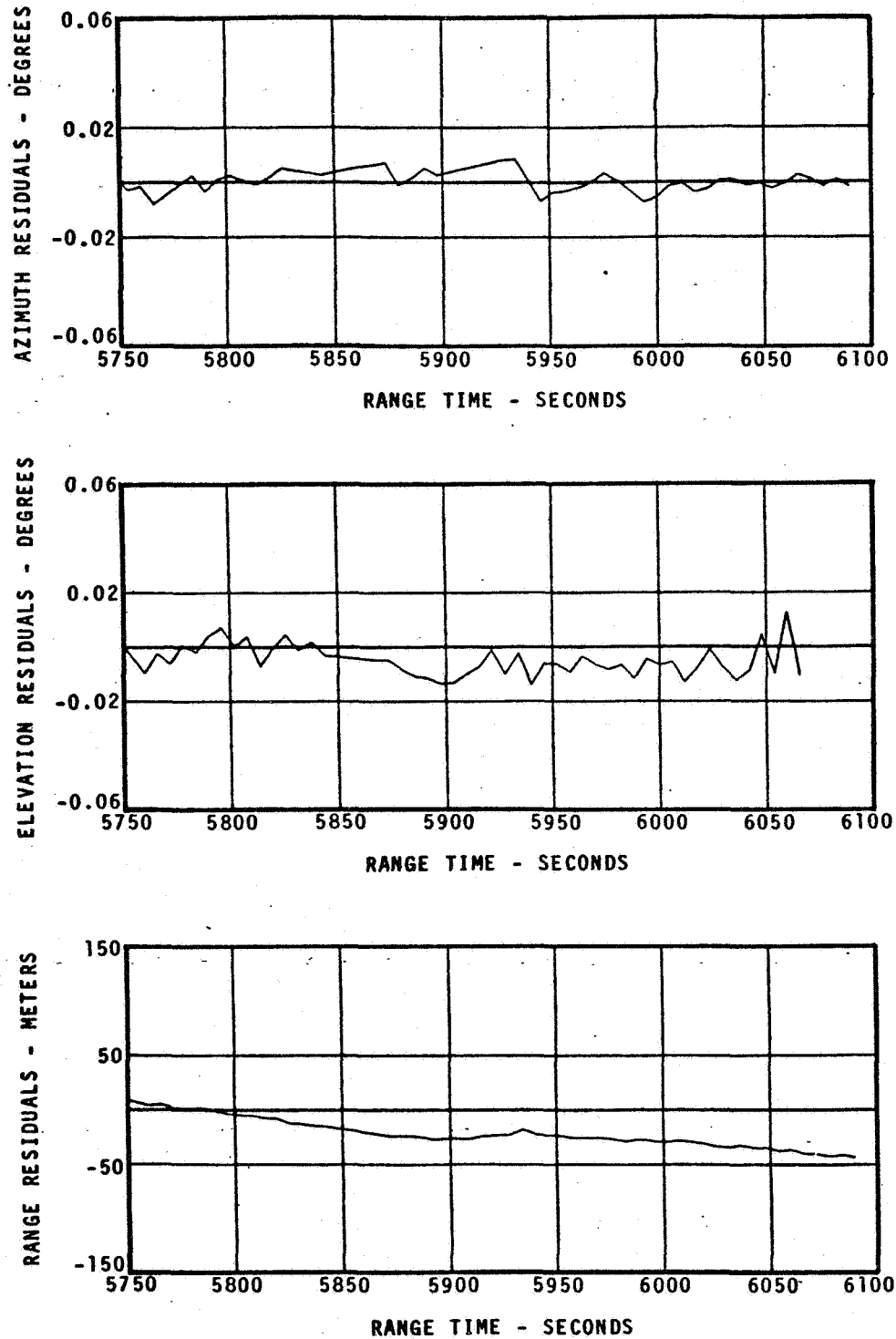


FIGURE 3-8. MERRITT ISLAND C-BAND RADAR TRACKING DEVIATIONS - PARKING ORBIT PHASE - REV. 1/2 (MLA)

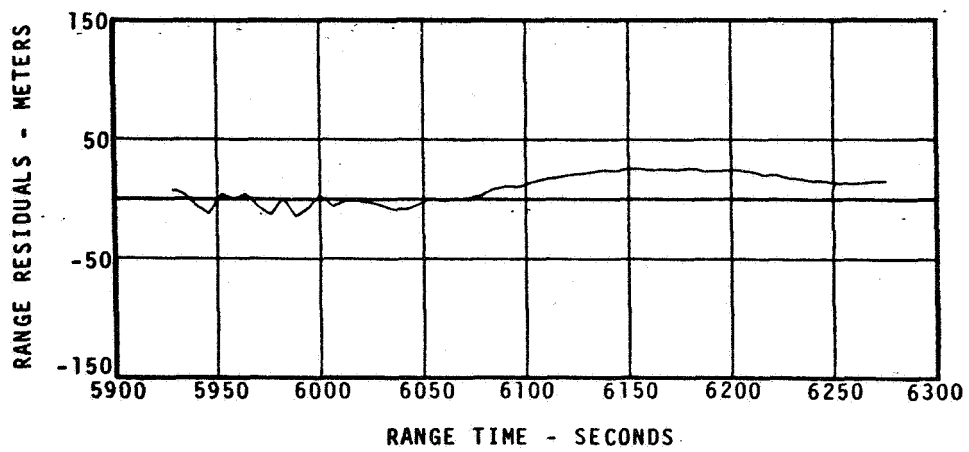
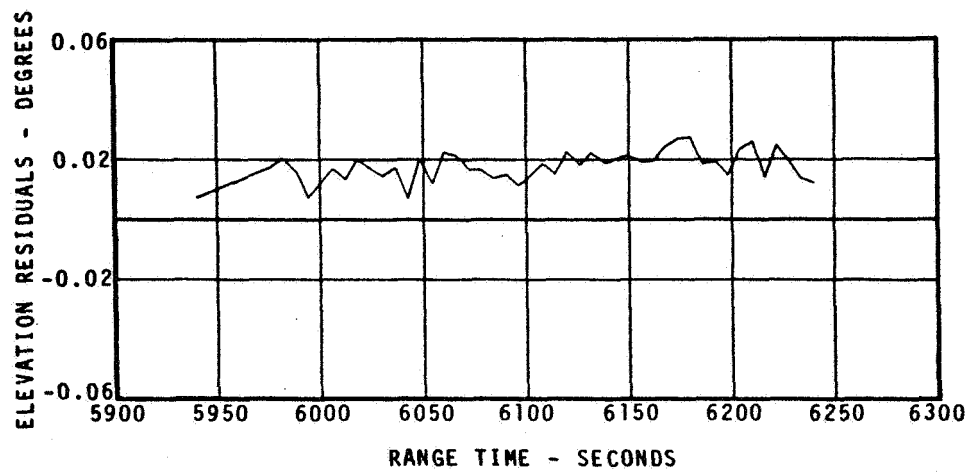
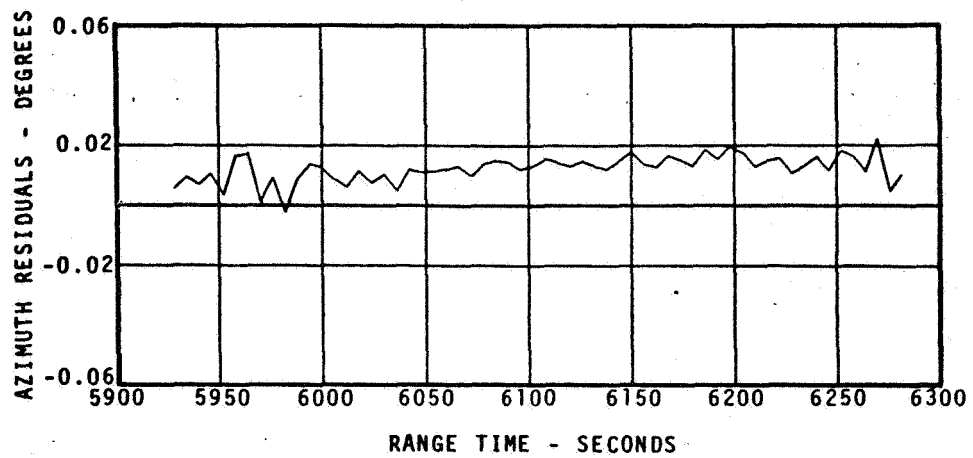


FIGURE 3-9. BERMUDA C-BAND RADAR TRACKING DEVIATIONS - PARKING ORBIT PHASE - REV. 2 (BDQ)

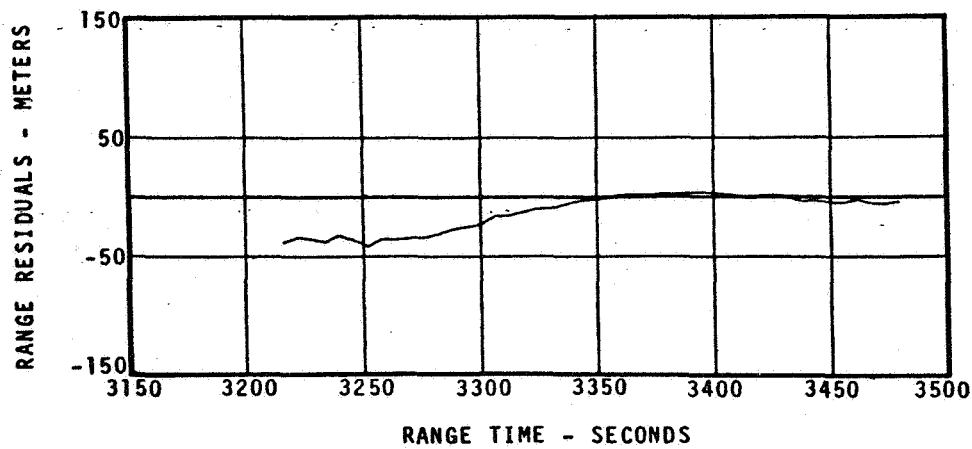
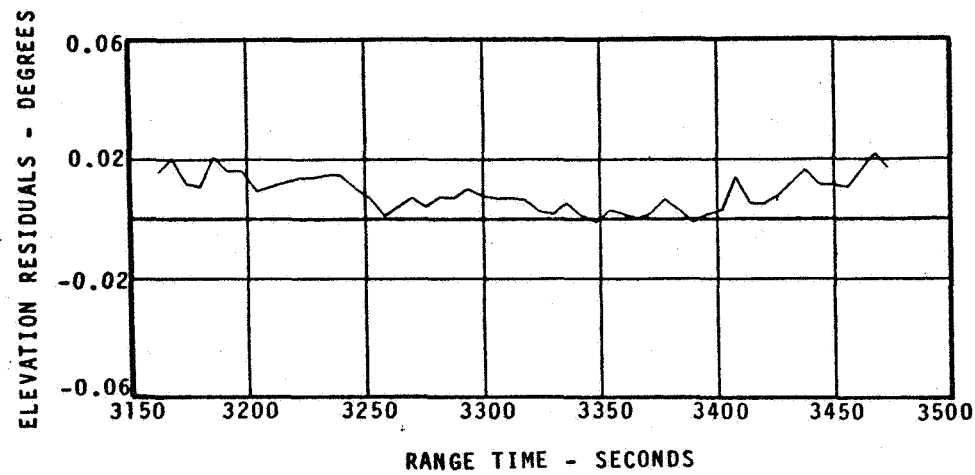
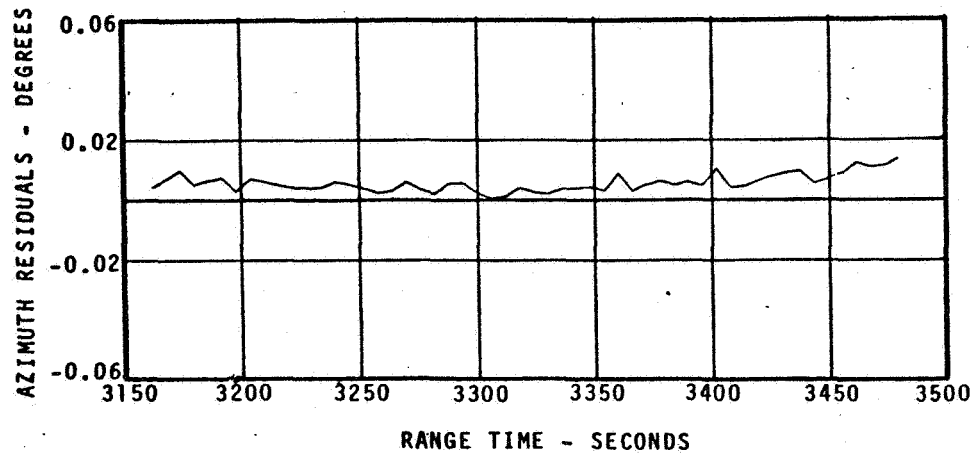


FIGURE 3-10. CARNARVON C-BAND RADAR TRACKING DEVIATIONS -  
PARKING ORBIT PHASE - REV. 1 (CRO)

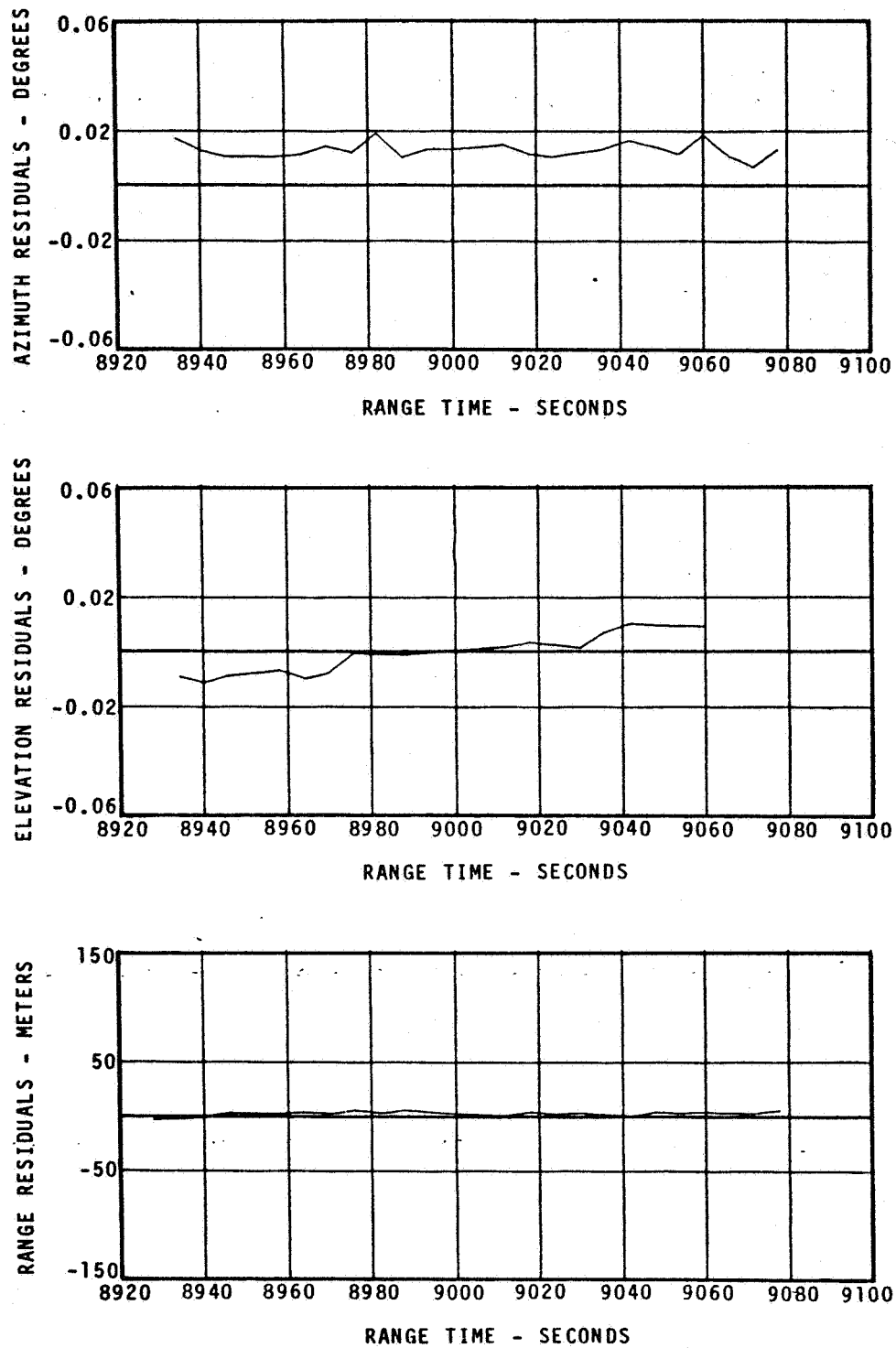


FIGURE 3-11. CARNARVON C-BAND RADAR TRACKING DEVIATIONS - PARKING ORBIT PHASE - REV. 2 (CRO)

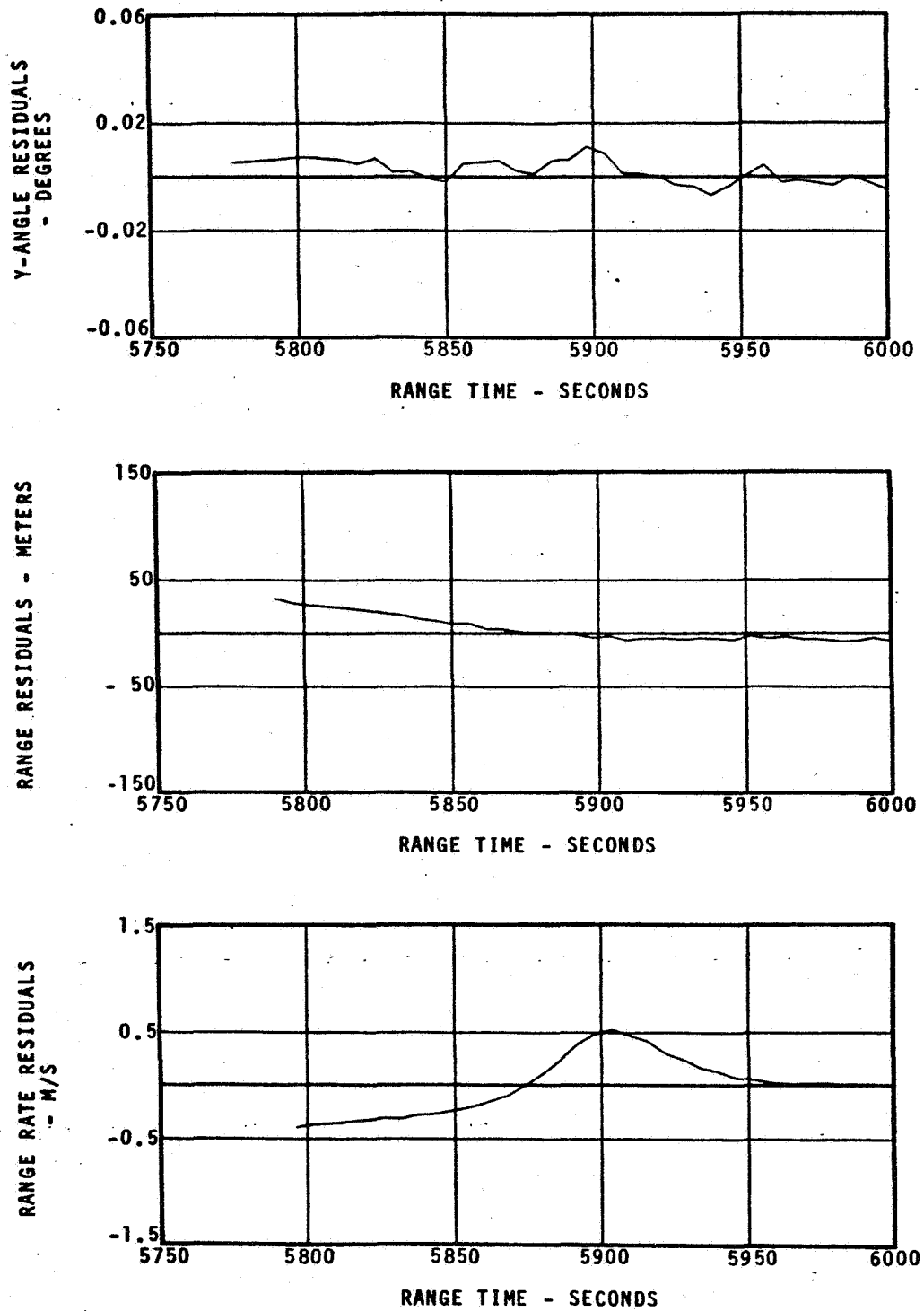


FIGURE 3-12. MERRITT ISLAND S-BAND TRACKING DEVIATIONS - PARKING ORBIT PHASE - REV. 1/2 (MIL)

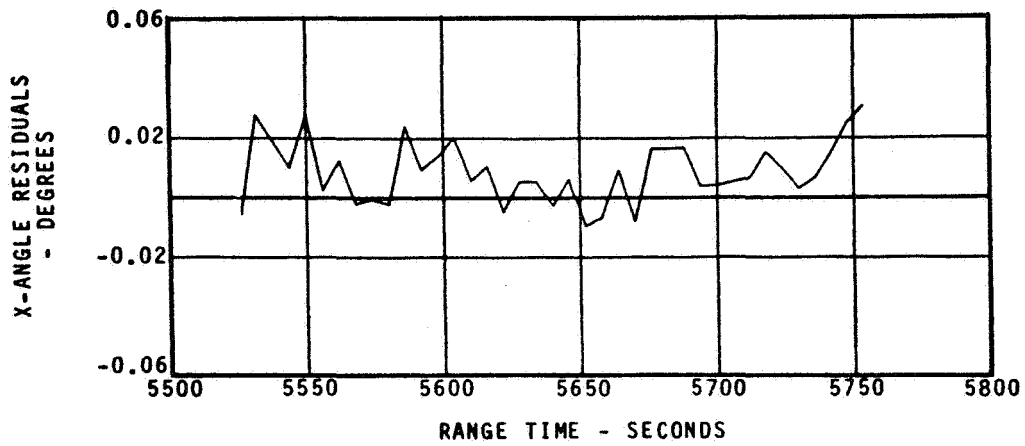
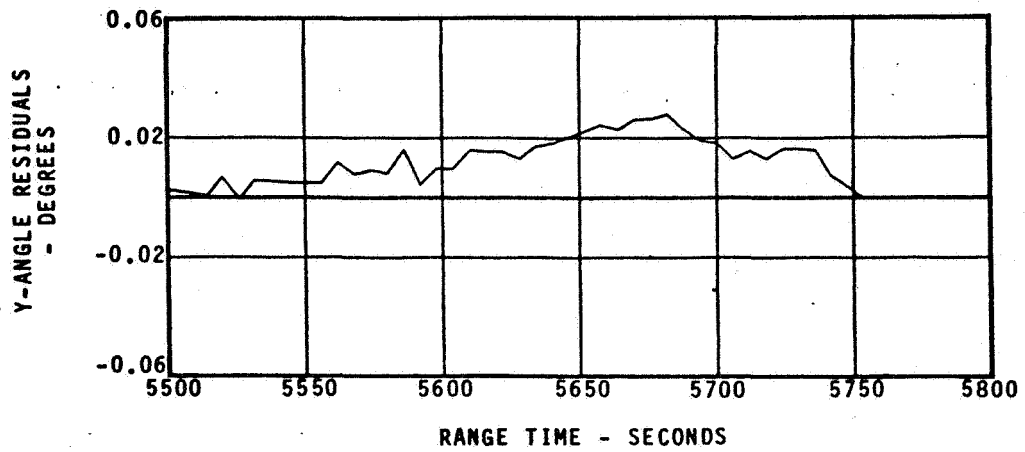
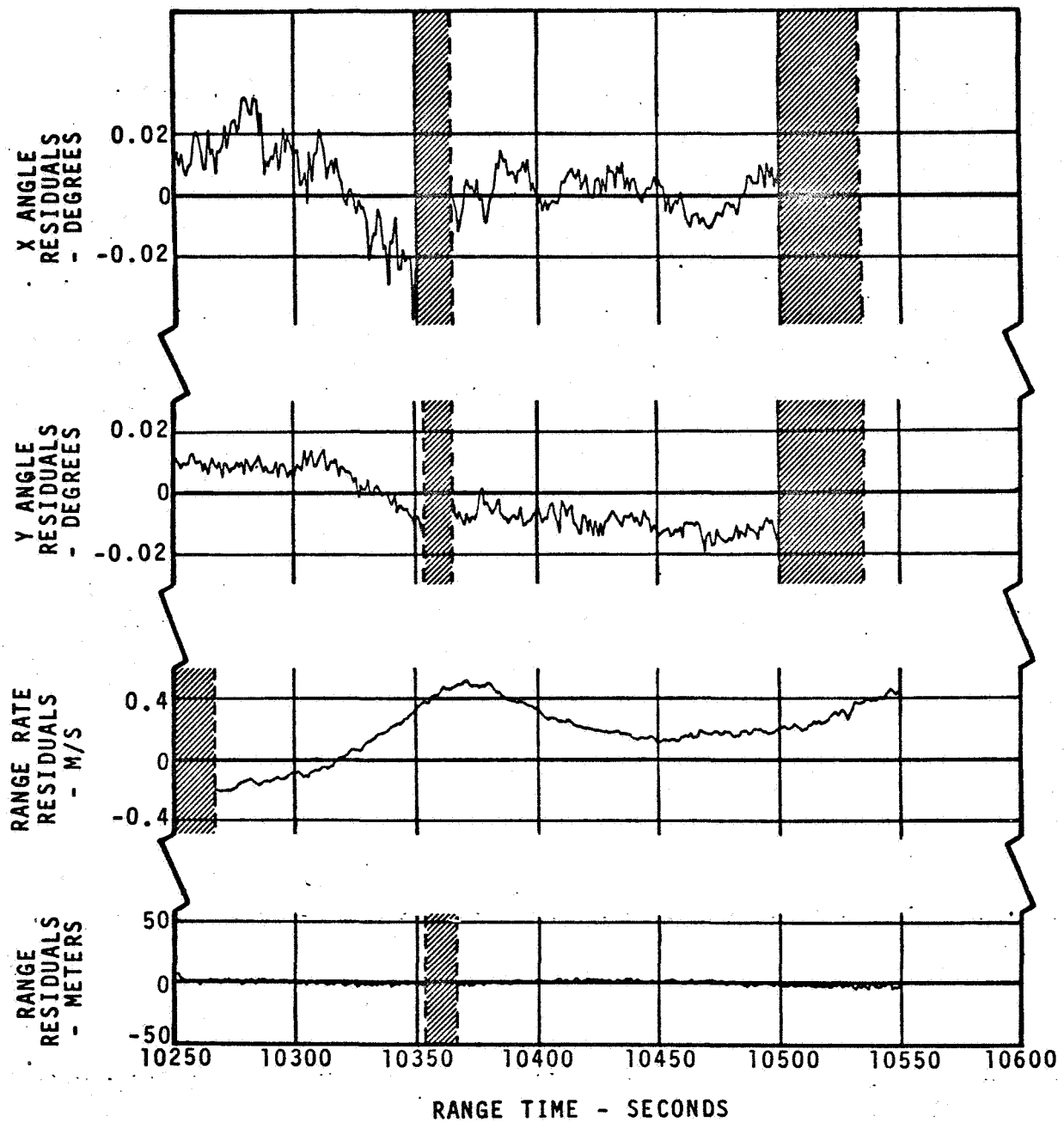


FIGURE 3-13. TEXAS S-BAND TRACKING DEVIATIONS - PARKING ORBIT  
PHASE - REV. 1 (TEX)



LEGEND:  DATA REJECTED

FIGURE 3-14. HAWAII S-BAND TRACKING DEVIATIONS - SECOND BURN PHASE (HWI)



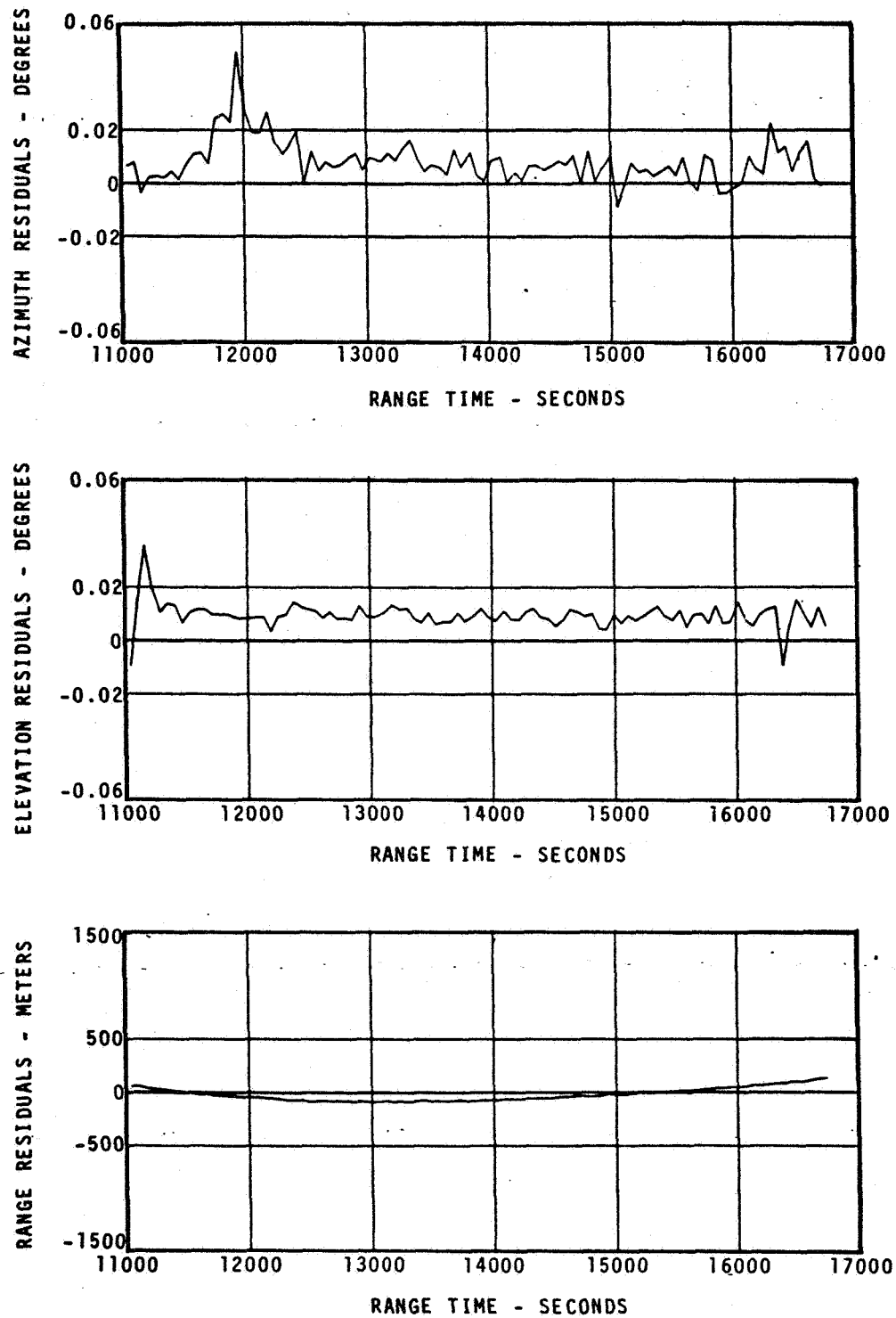


FIGURE 3-15. BERMUDA C-BAND RADAR TRACKING DEVIATIONS -  
TRANSLUNAR ORBIT PHASE (BDQ)

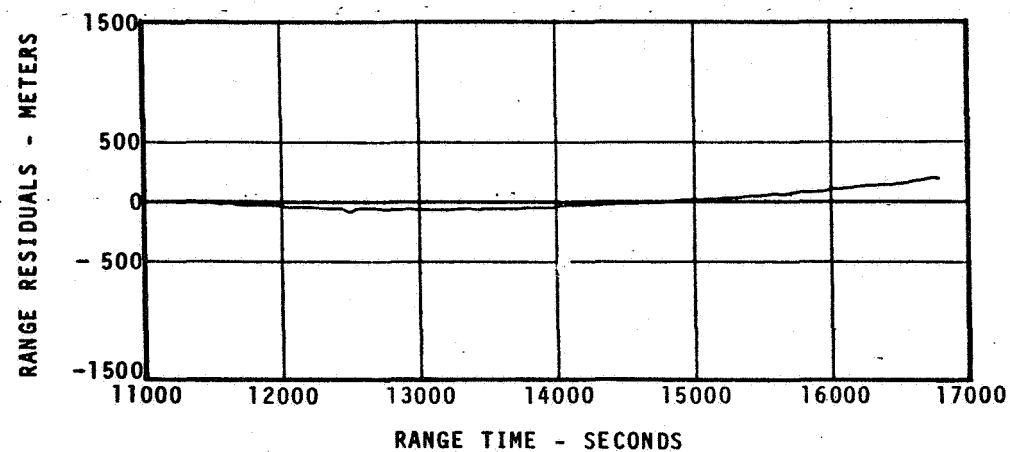
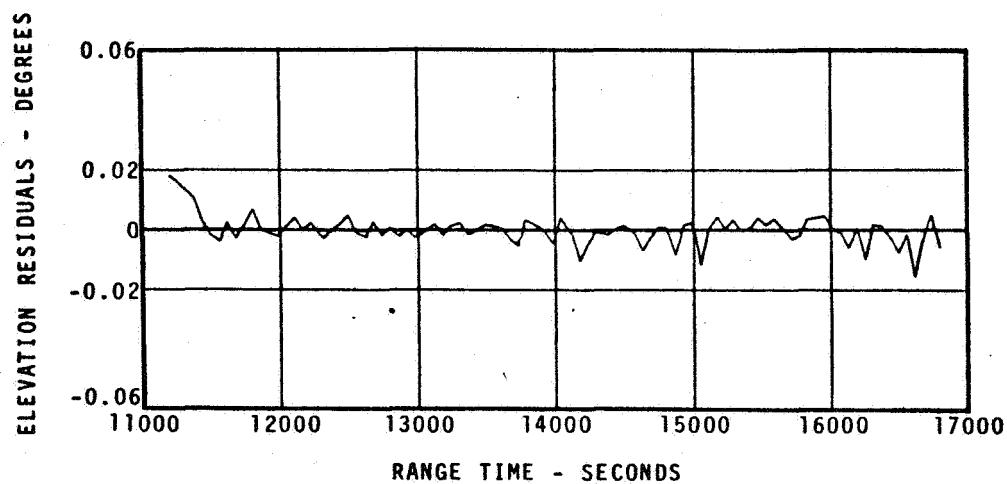
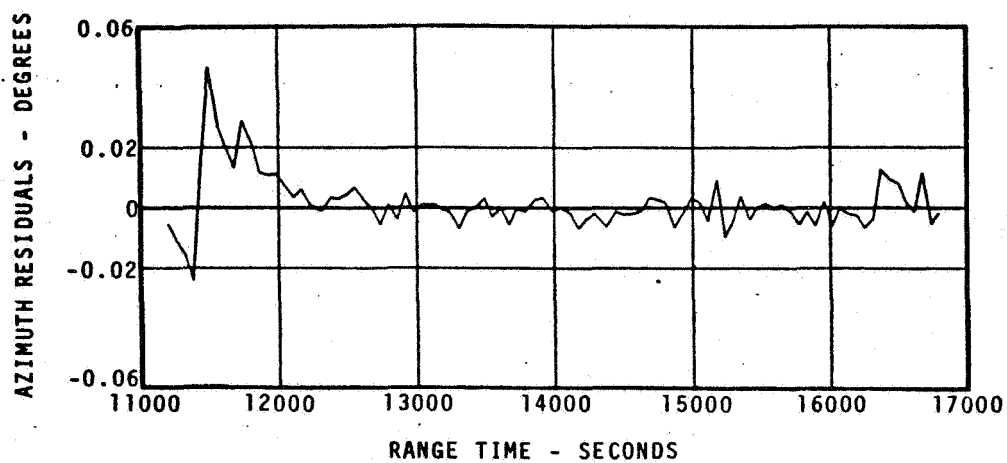
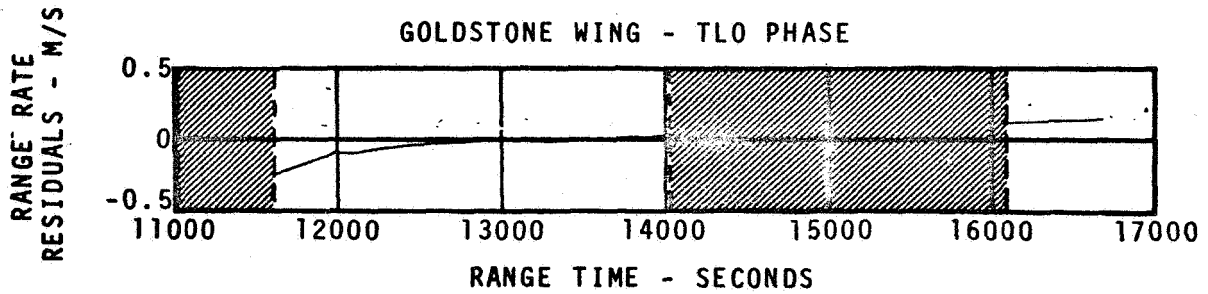
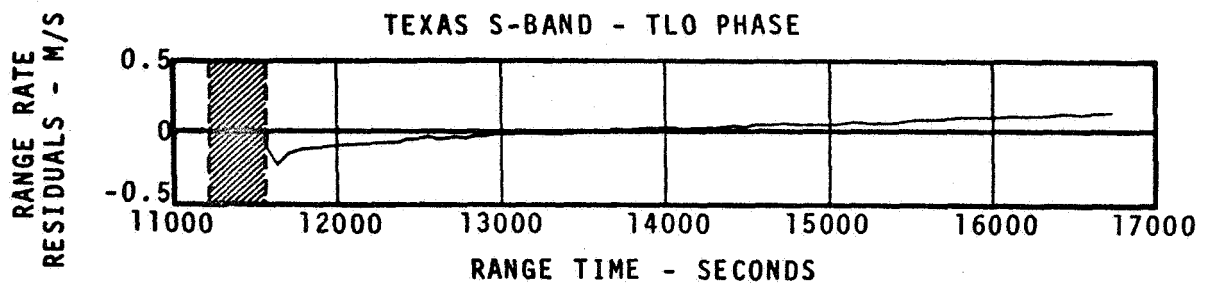
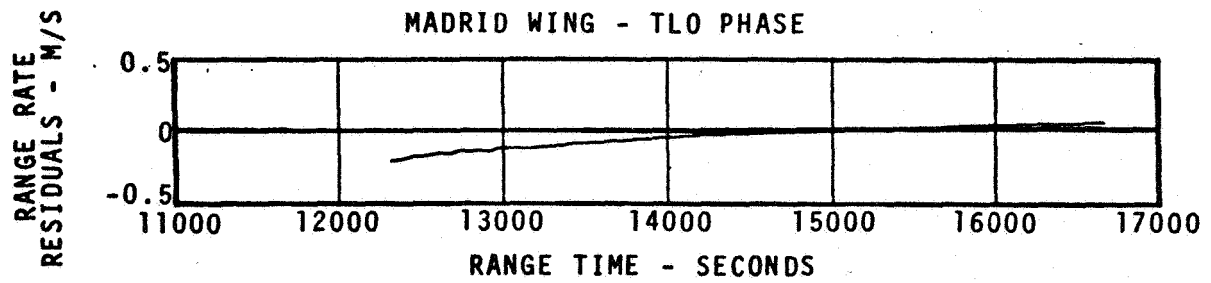


FIGURE 3-16 MERRITT ISLAND C-BAND RADAR TRACKING DEVIATIONS -  
TRANSLUNAR ORBIT PHASE (MLA)



LEGEND: // DATA REJECTED

FIGURE 3-17. S-BAND RANGE RATE TRACKING DEVIATIONS - TRANSLUNAR ORBIT PHASE

## MERRITT IS. (19.18)

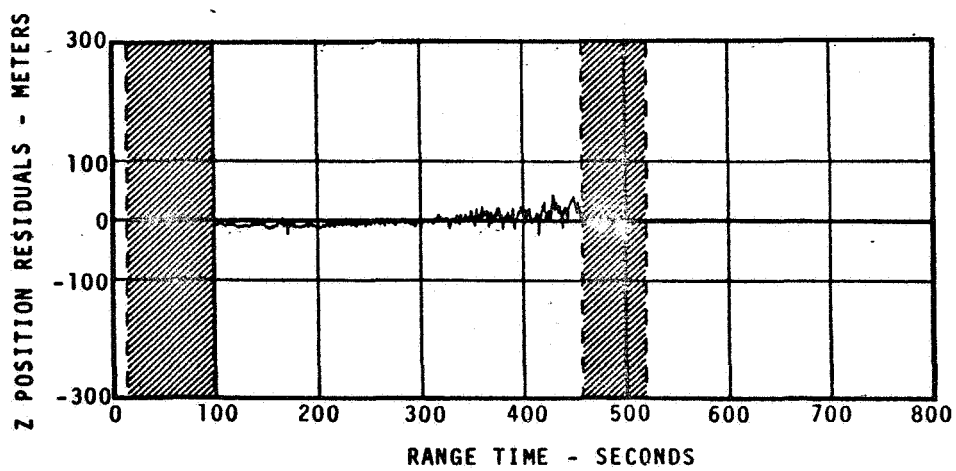
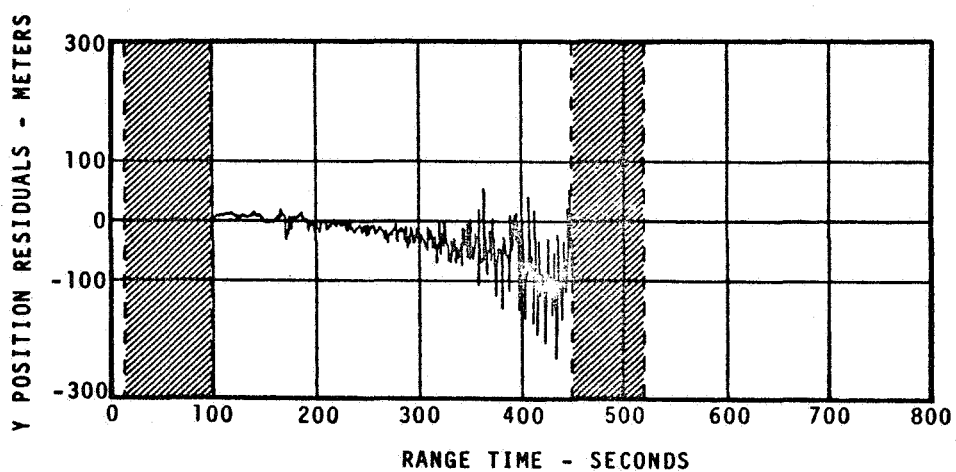
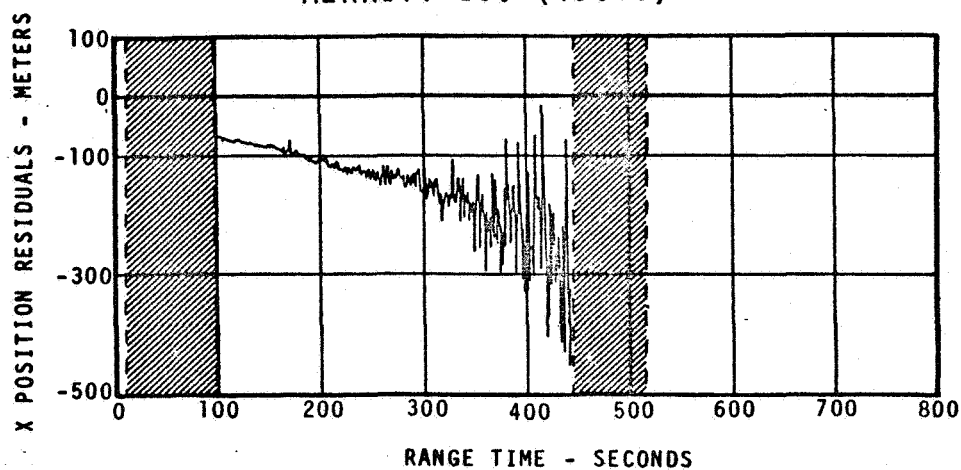
LEGEND:  DATA REJECTED

FIGURE 3-18. PACSS10 POSITION DEVIATIONS - ASCENT PHASE (MLA)

PATRICK (0.18)

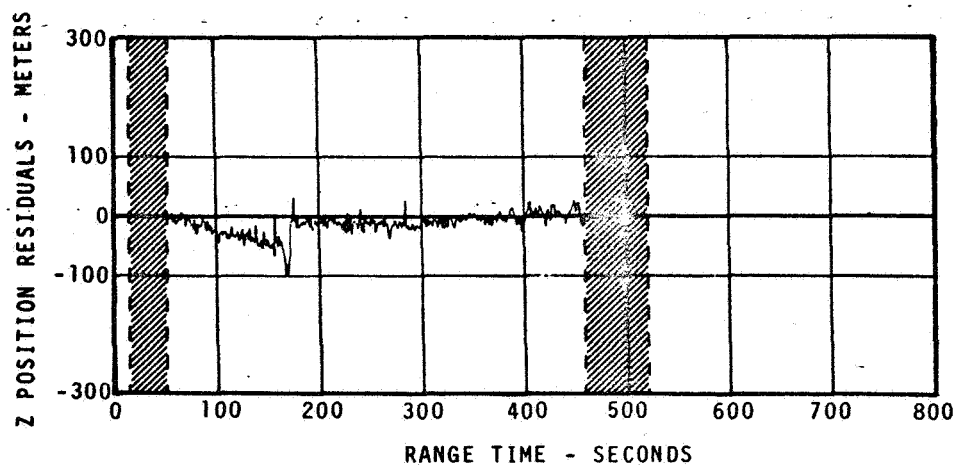
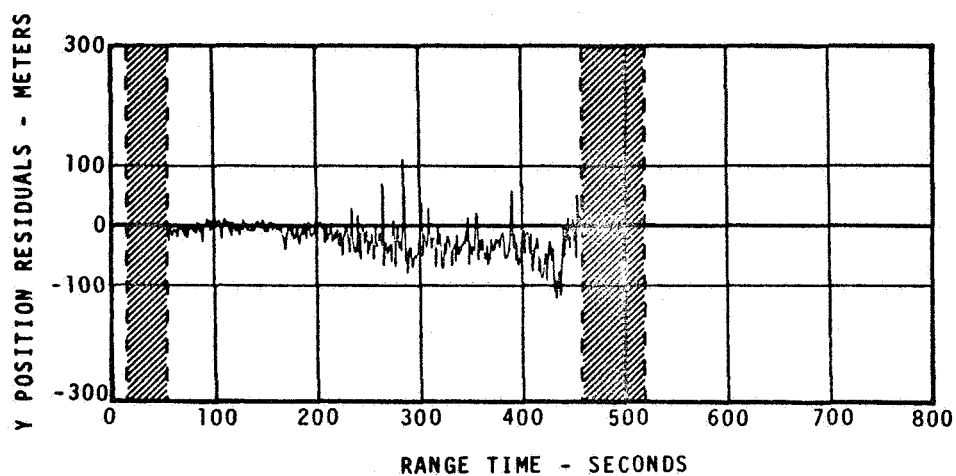
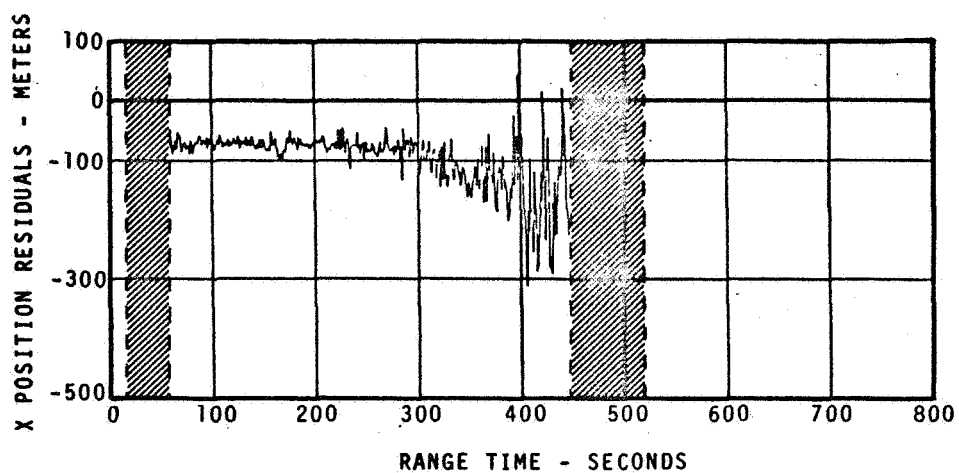
LEGEND:  DATA REJECTED

FIGURE 3-19. PACSS10 POSITION DEVIATIONS - ASCENT PHASE (PAT)

## BERMUDA (67.16)

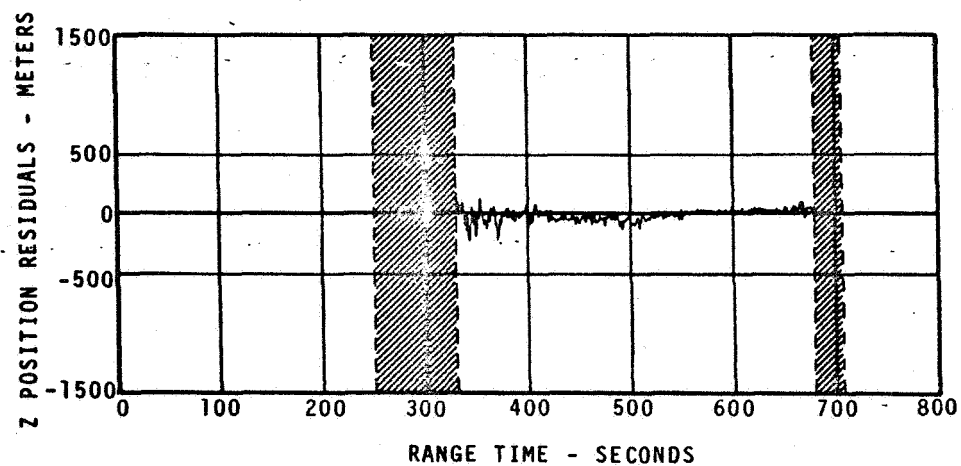
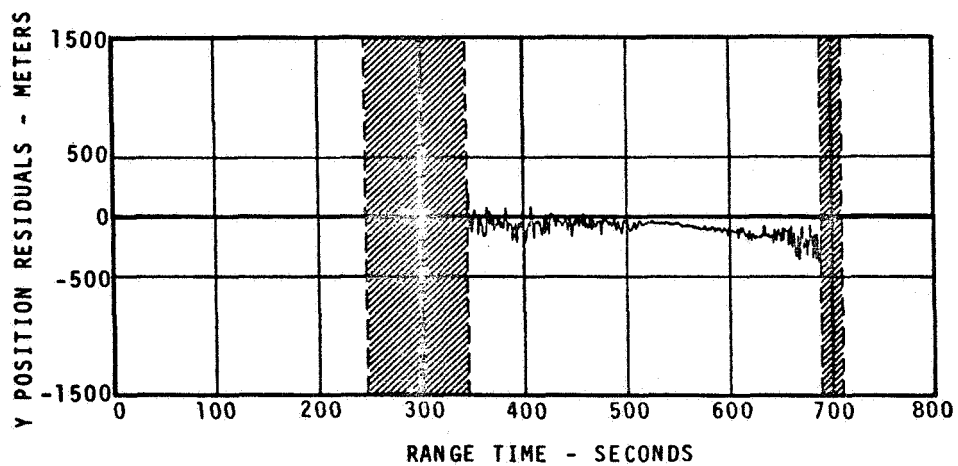
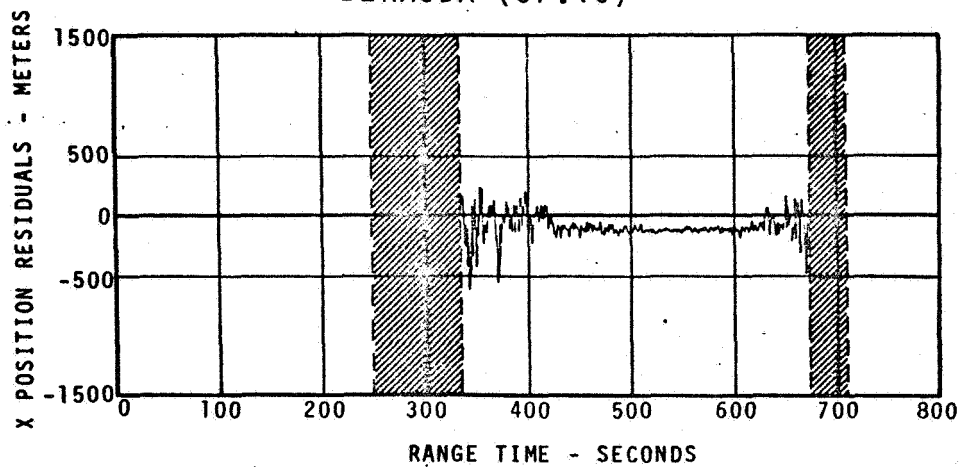
LEGEND:  DATA REJECTED

FIGURE 3-20. PACSS10 POSITION DEVIATIONS - ASCENT PHASE (BDA)

## BERMUDA (67.18)

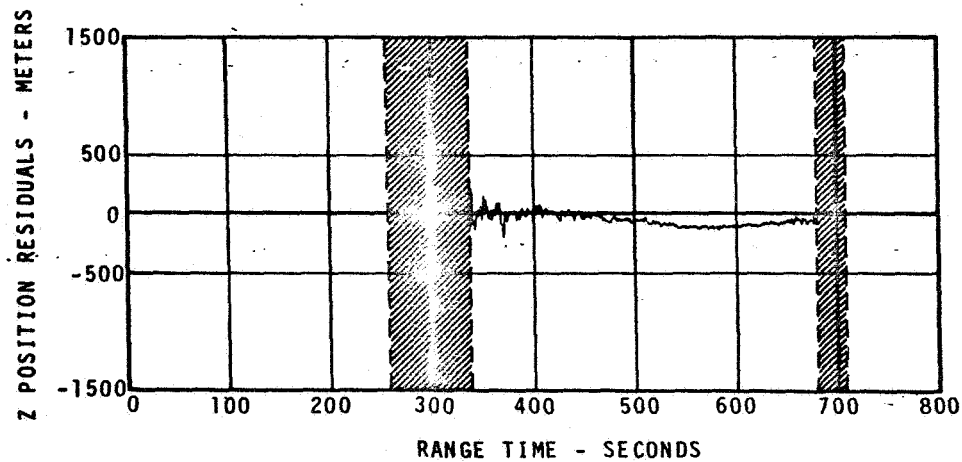
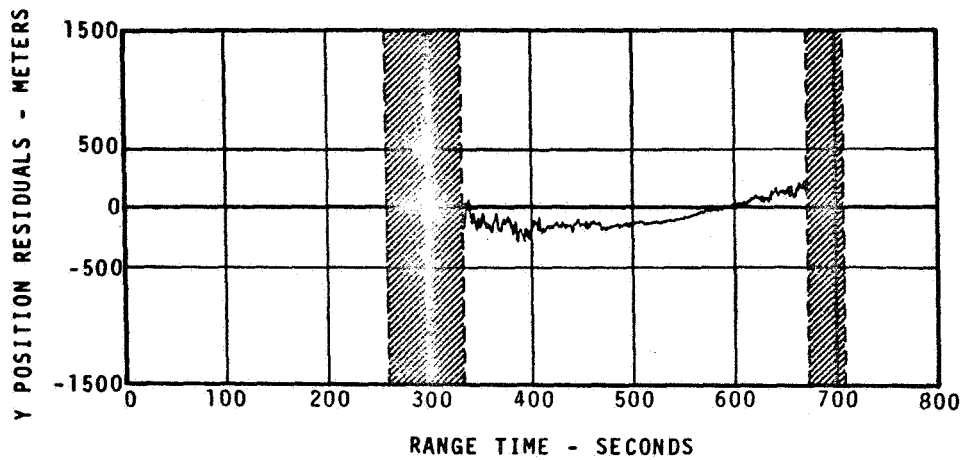
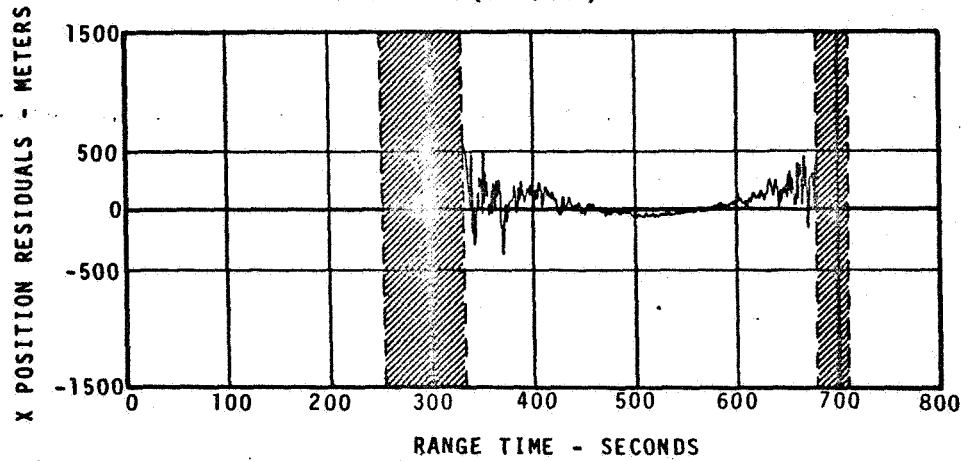
LEGEND:  DATA REJECTED

FIGURE 3-21. PACSS10 POSITION DEVIATIONS - ASCENT PHASE (BDQ)

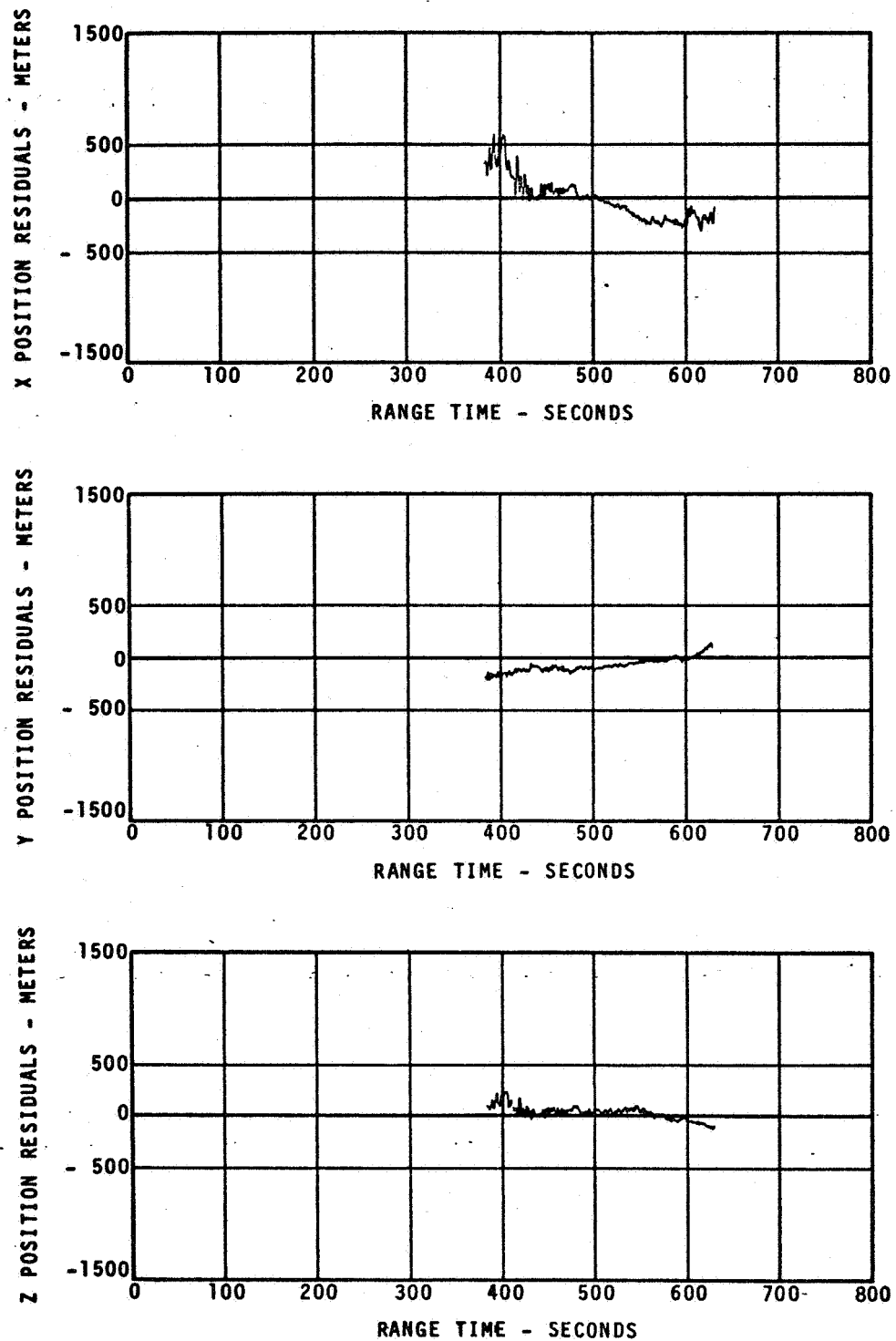
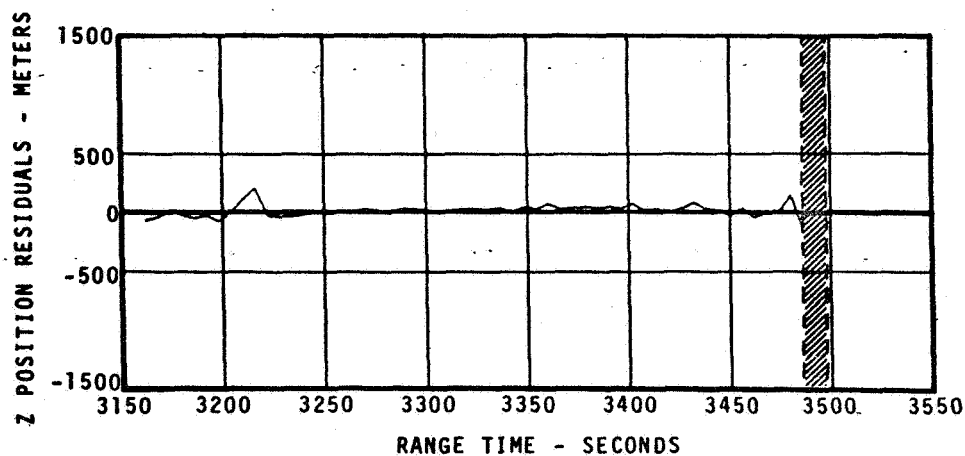
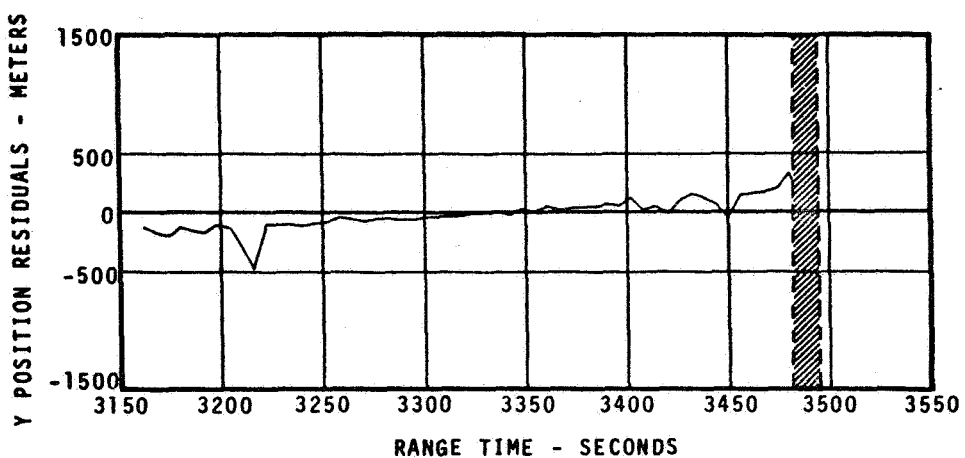
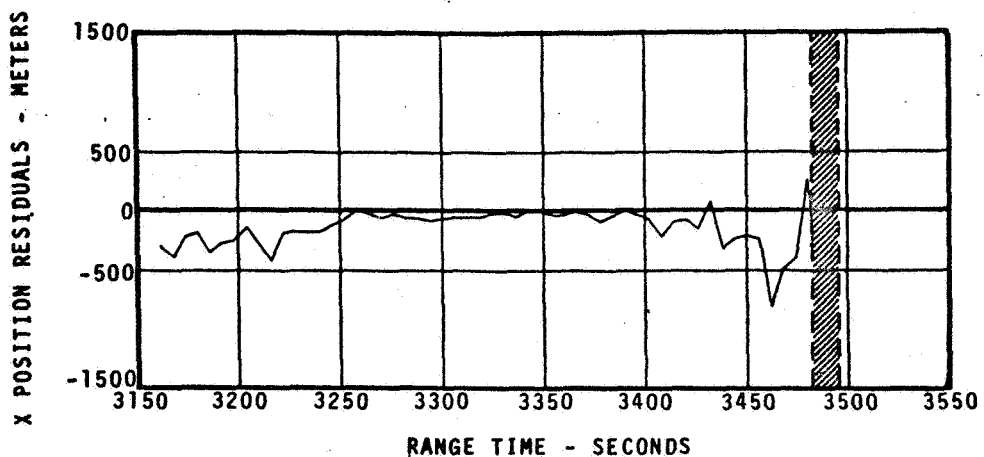


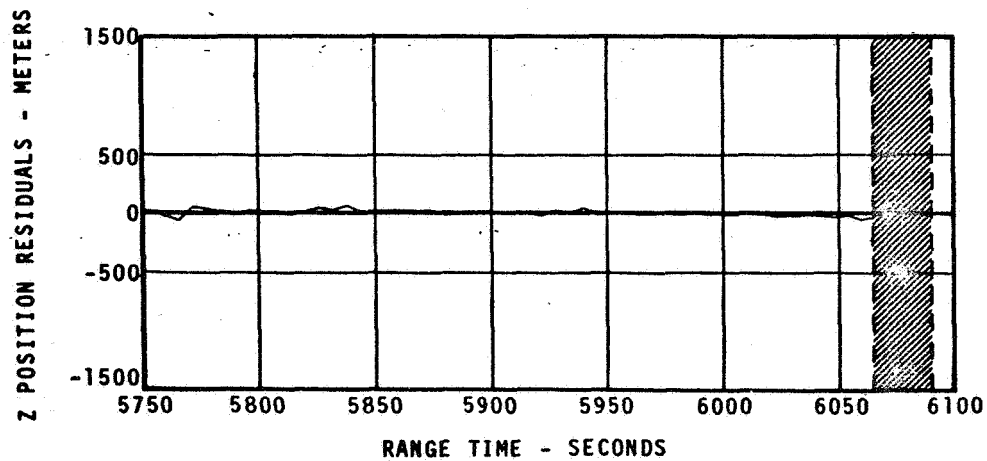
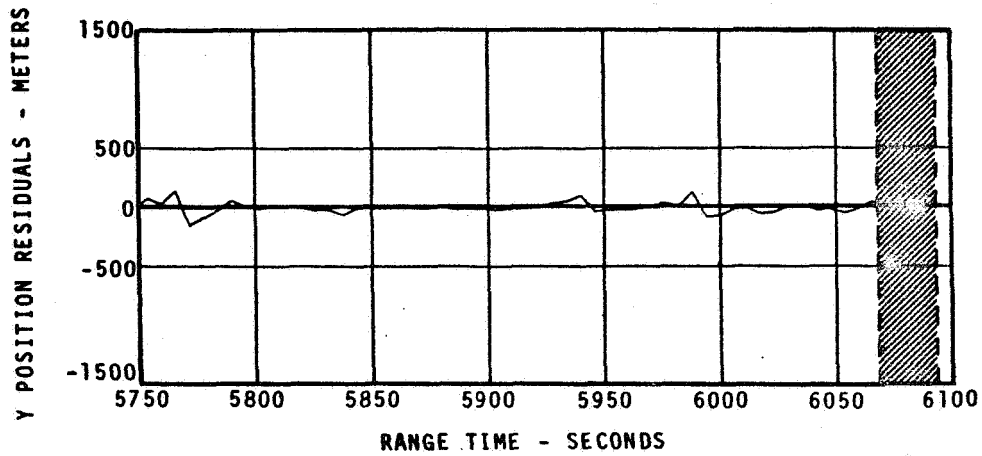
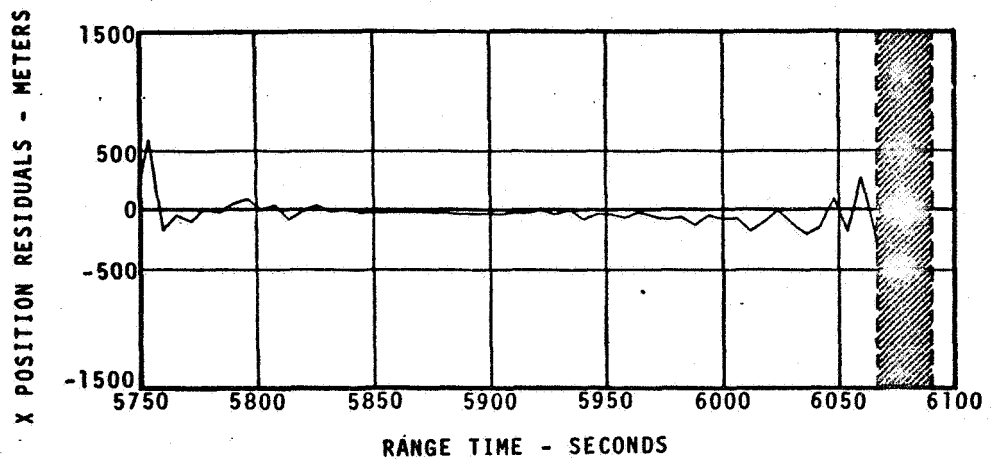
FIGURE 3-22. PACSS10 POSITION DEVIATIONS - ASCENT PHASE (BDS)





LEGEND:  DATA REJECTED

FIGURE 3-23. PACSS10 POSITION DEVIATIONS - PARKING ORBIT PHASE  
- REV. 1 (CRO)



LEGEND: // DATA REJECTED

FIGURE 3-24. PACSS10 POSITION DEVIATIONS - PARKING ORBIT PHASE  
- REV. 1/2 (MLA)

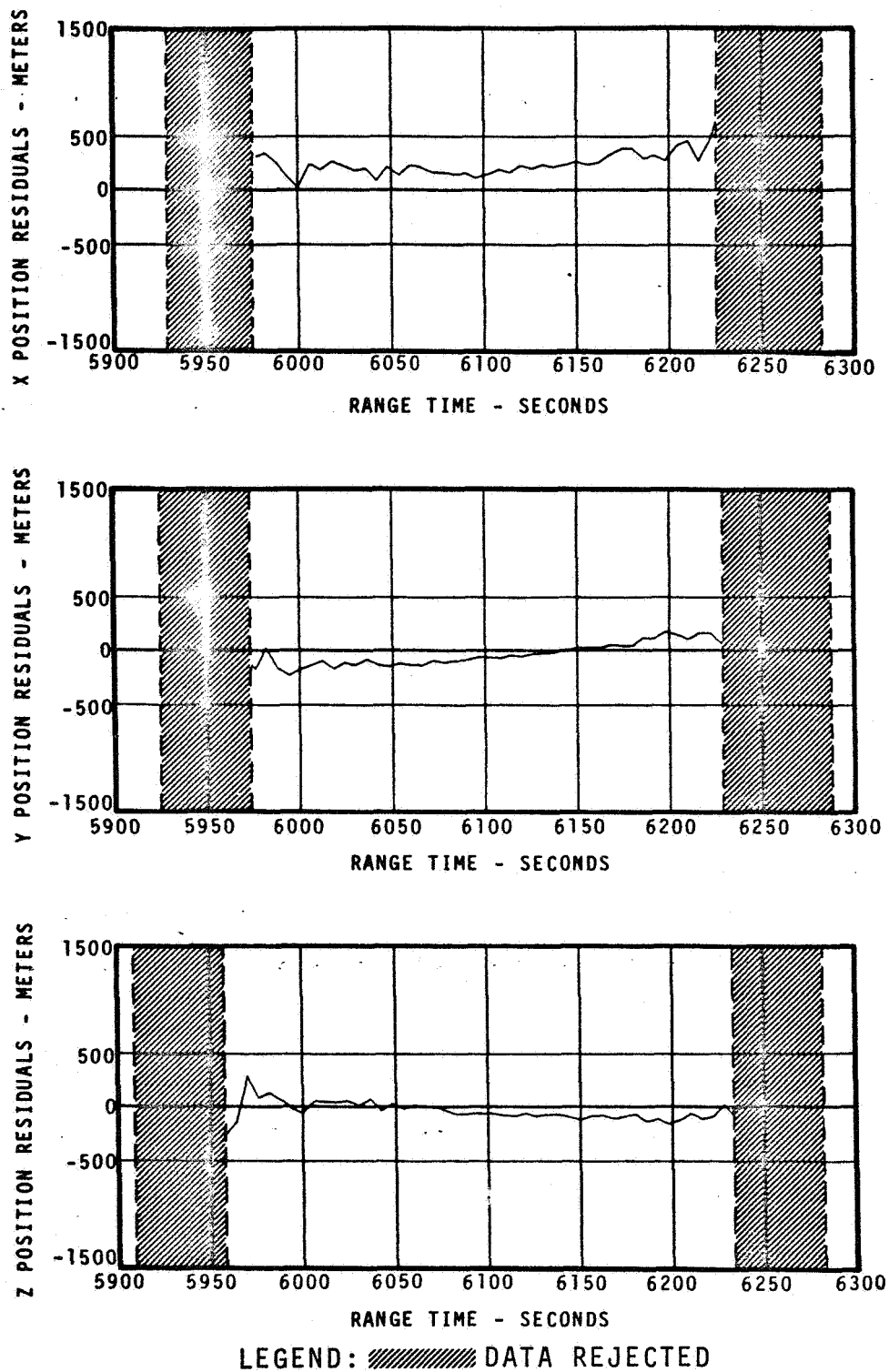
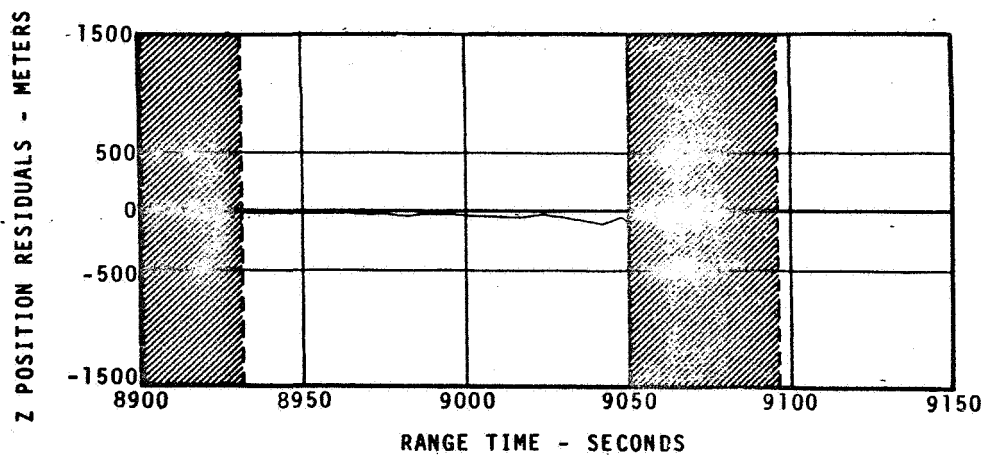
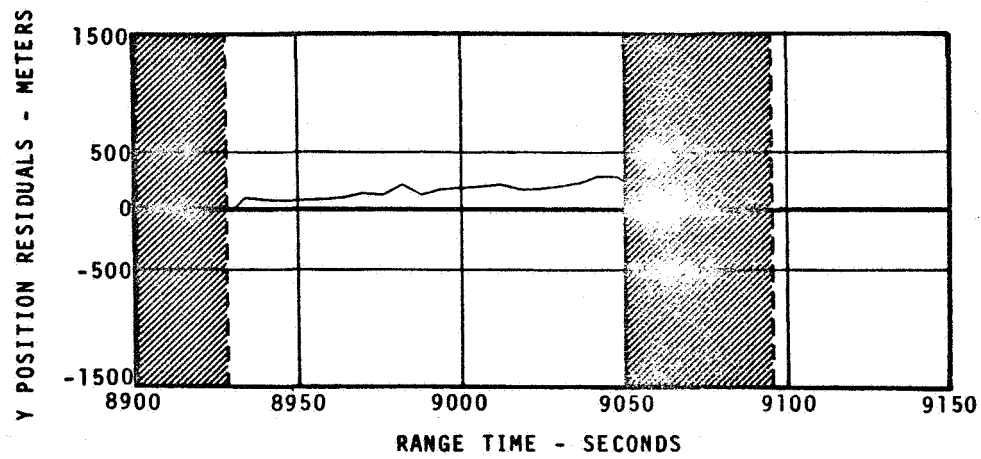
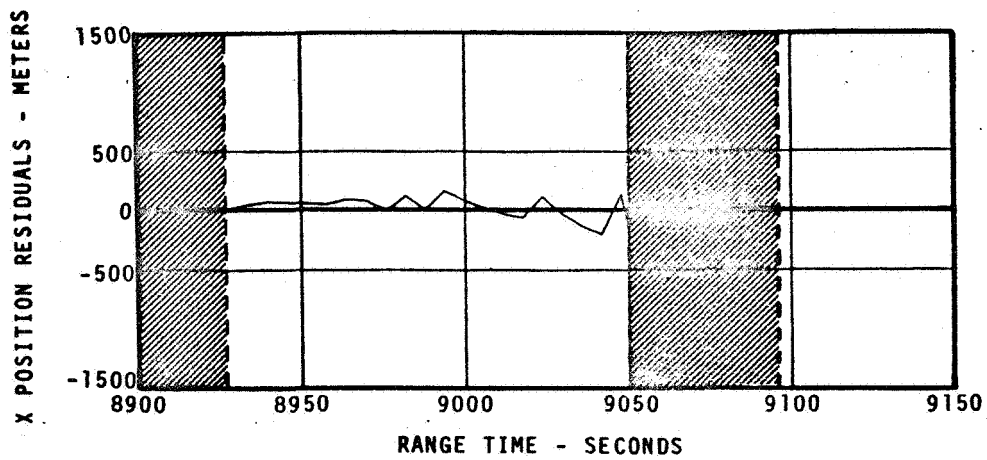


FIGURE 3-25. PACSS10 POSITION DEVIATIONS - PARKING ORBIT PHASE  
- REV. 2 (BDQ)



LEGEND: DATA REJECTED

FIGURE 3-26. PACSS10 POSITION DEVIATIONS - PARKING ORBIT PHASE  
- REV. 2 (CRO)

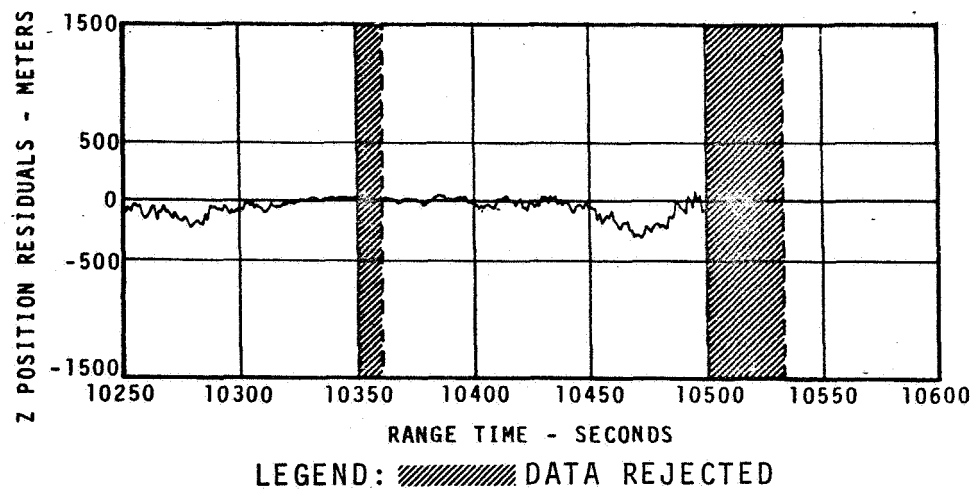
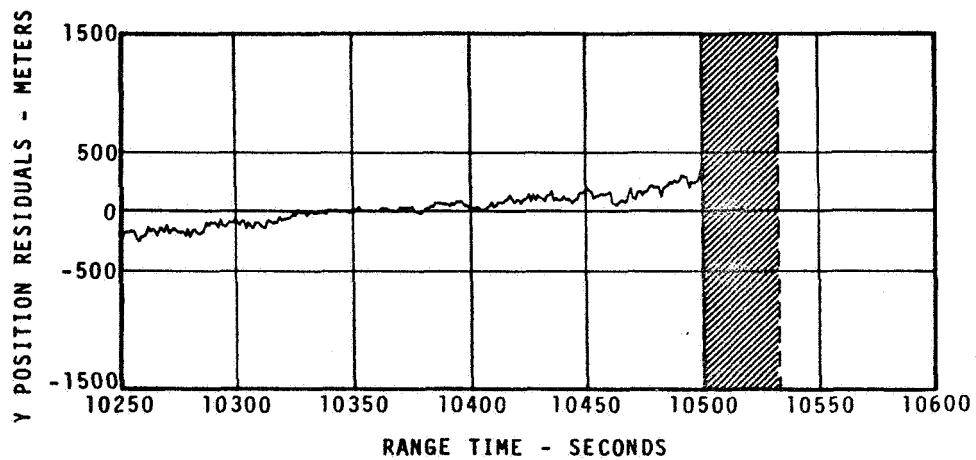
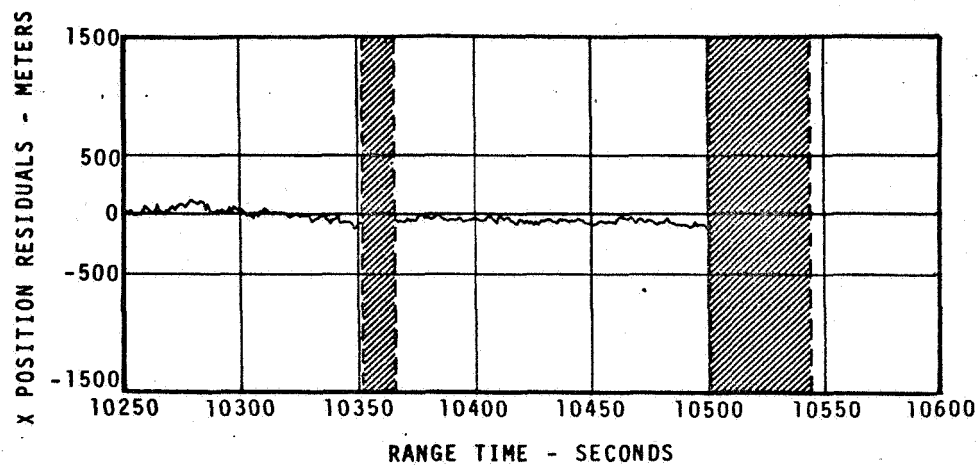


FIGURE 3-27. PACSS10 POSITION DEVIATIONS - SECOND BURN PHASE (HWI)

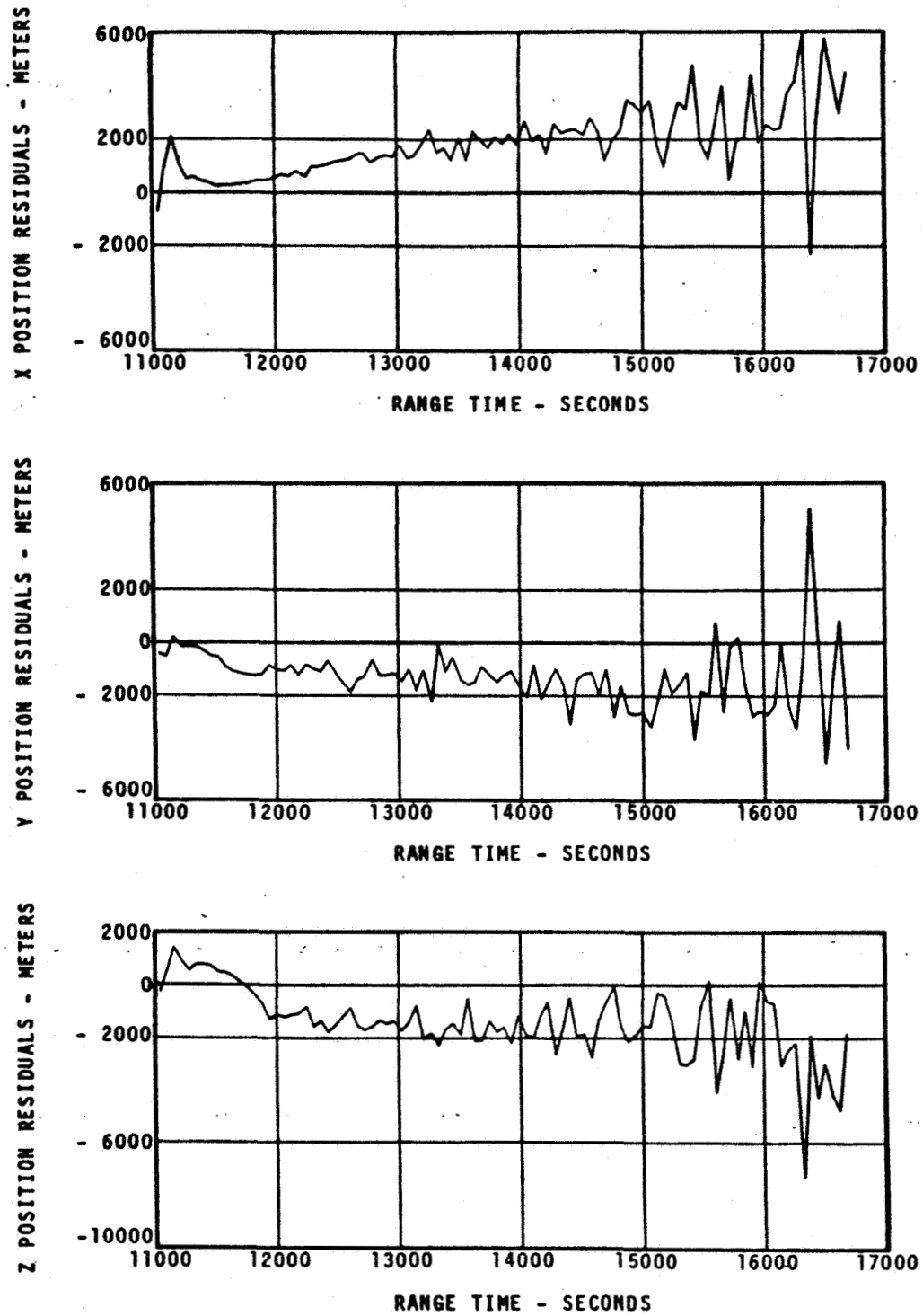


FIGURE 3-28. PACSS10 POSITION DEVIATIONS - TRANSLUNAR ORBIT  
PHASE (BDQ)

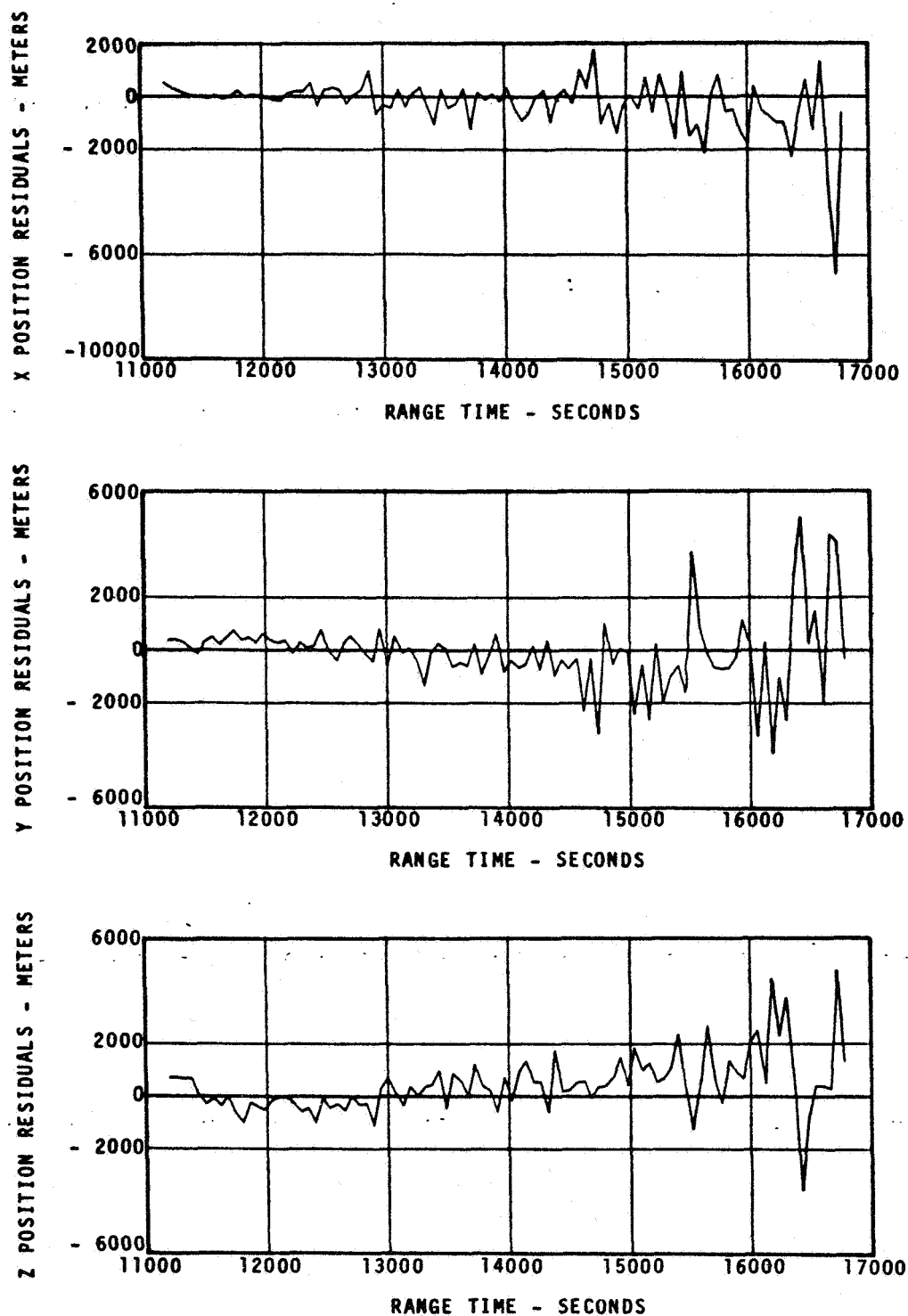


FIGURE 3-29. PACSS10 POSITION DEVIATIONS - TRANSLUNAR ORBIT PHASE (MLA)

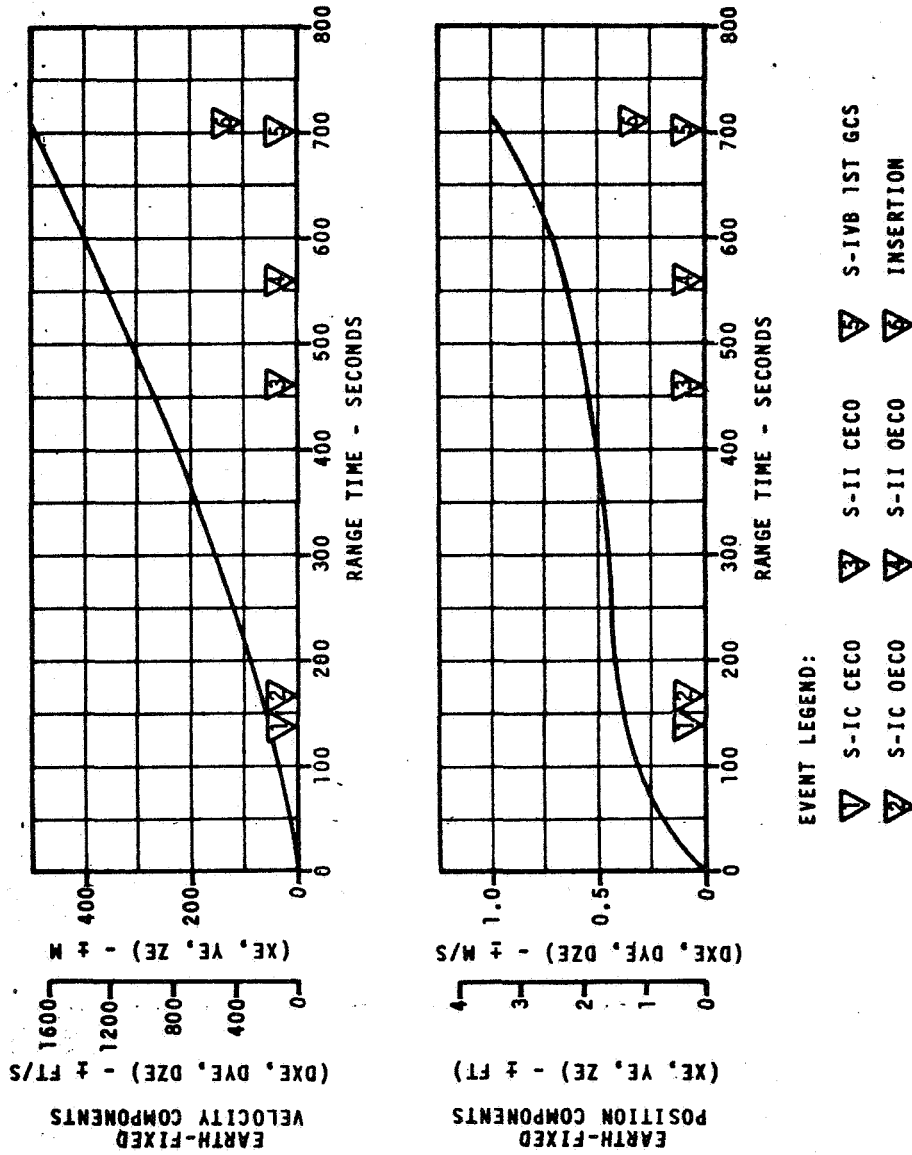


FIGURE 3-30. ESTIMATED TRAJECTORY UNCERTAINTY - ASCENT PHASE



TABLE 3-I. TRACKING STATION LOCATIONS

ABBREVIATION	NAME	LONGITUDE, E	LATITUDE, N	HEIGHT (m)
MLA	Merritt Island C-Band (19.18)	279.33538055	28.42485833	-40.0
PAT	Patrick AFB C-Band (0.18)	279.40074444	28.22655278	-9.0
GTK	Grand Turk C-Band (7.18)	288.86744157	21.46288889	28.0
BDQ	Bermuda C-Band (67.18)	295.34628333	32.34792778	-36.0
BDA	Bermuda C-Band (67.16)	295.34622500	32.34806667	-37.0
CRO	Carnarvon C-Band	113.71732778	-24.89639167	-11.0
MIL	Merritt Island USB	279.30636667	28.50827222	-42.0
HWI	Hawaii USB	200.33450278	22.12630833	1135.0
TEX	Texas USB	262.62083333	27.65375000	-20.0
PIR	Goldstone MSFN Wing	243.15033333	35.38956944	971.0
RID	Madrid MSFN Wing	355.75071111	40.42829167	770.0
BDS	Bermuda USB	295.34184444	32.35125000	-2.0

## APPENDIX A

## DEFINITIONS OF TRAJECTORY SYMBOLS AND COORDINATE SYSTEMS

SYMBOL	DEFINITION
XE, YE, ZE DXE, DYE, DZE DDXE, DDYE, DDZE	Position, velocity, and acceleration components of vehicle Instrument Unit in Earth-Fixed Launch Site Coordinate System. The origin of this system is at the intersection of Fischer Ellipsoid (1960) and the normal to it which passes through the launch site. The X-axis coincides with the ellipsoid normal passing through the site, positive upward. The Z-axis is parallel to the earth-fixed flight azimuth, defined at guidance reference release time, and is positive down range. The Y-axis completes a right-handed system. This coordinate system is identical to Standard Coordinate System 10 of Project Apollo Coordinate System Standards, abbreviated as PACSS10.
XS, YS, ZS DXD, DYS, DZS DDXS, DDYS, DDZS	Position, velocity, and acceleration components of vehicle Instrument Unit in Launch Vehicle Navigation Coordinate System. The origin of this system is at the center of the earth. The X-axis is parallel to Fischer Ellipsoid normal through the launch site, positive upward. The Z-axis is parallel to the flight azimuth, positive downrange. The Y-axis completes a right-handed system. The direction of the coordinate axes remains fixed in space at guidance reference release. This coordinate system is identical to Standard Coordinate System 13 of Project Apollo Coordinate System Standards, abbreviated as PACSS13.
GC DIST GC LAT GD LAT LONG	Position components of vehicle Instrument Unit in Geographic Polar Coordinate System. Position in this system is defined by the geocentric distance (GC DIST), geocentric latitude (GC LAT), geodetic latitude (GD LAT), and longitude (LONG). Geocentric distance is the

## APPENDIX A (Continued)

distance from the geocenter to vehicle Instrument Unit. Geocentric latitude is the angle between the radius vector of the subvehicle point and the equatorial plane, positive north of the equatorial plane. Geodetic latitude is the angle between the normal to the Fischer Ellipsoid through the subvehicle point and the equatorial plane, positive north of the equatorial plane. Longitude is the angle between the projection of the radius vector into the equatorial plane and the Greenwich meridian, positive east of the Greenwich meridian. This coordinate system is identical to Standard Coordinate System 1 of Project Apollo Coordinate System Standards, abbreviated as PACSS1.

EF VEL  
VEL-AZ  
VEL-EL

Earth-fixed velocity of vehicle Instrument Unit in Geographic Polar Coordinate System. Velocity in this system is given in terms of azimuth (VEL-AZ), elevation (VEL-EL), and magnitude of the velocity vector (EF VEL). Azimuth is the angle between the projection of the velocity vector into the local horizontal plane and the north direction in this plane, positive east of north. Elevation is the angle between the velocity vector and the local horizontal plane, positive above the horizontal plane. This coordinate system is identical to Standard Coordinate System 1 of Project Apollo Coordinate System Standards, abbreviated as PACSS1.

SF VEL  
FLT-PATH  
HEAD

Space-fixed velocity of vehicle Instrument Unit in Geographic Polar Coordinate System. Velocity in this system is given in terms of heading angle (HEAD), flight path angle (FLT-PATH), and magnitude of velocity vector (SF VEL). Heading angle is the angle between the projection of the velocity vector into the local horizontal plane and the north direction in this plane, positive east of north. Flight path angle is the angle between the velocity vector and

APPENDIX A (Continued)

the local horizontal plane, positive above the horizontal plane. This coordinate system is identical to Standard Coordinate System 1 of Project Apollo Coordinate System Standards, abbreviated at PACSS1.

ALTITUDE

Perpendicular distance from vehicle Instrument Unit to Fischer Ellipsoid, positive above Fischer Ellipsoid.

RANGE

Surface range, measured along Fischer Ellipsoid from the launch site to the subvehicle point.

TIME

Range time, referenced to nearest integer second before IU umbilical disconnect.

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APPENDIX B

TIME HISTORY OF TRAJECTORY PARAMETERS - METRIC UNITS

The postflight trajectory, from guidance reference release to CSM separation, is tabulated in metric units in Tables B-I through B-VII.

Table B-I gives the earth-fixed launch site position, velocity, and acceleration components for the ascent phase of flight.

Table B-II gives the launch vehicle navigation position, velocity, and acceleration components for the ascent phase of flight.

Table B-III gives the geographic polar coordinates for the ascent phase of flight.

Table B-IV gives the geographic polar coordinates for the parking orbit phase of flight.

Table B-V gives the earth-fixed launch site position, velocity, and acceleration components for the second burn and translunar phases of flight.

Table B-VI gives the launch vehicle navigation position, velocity, and acceleration components for the second burn and translunar phases of flight.

Table B-VII gives the geographic polar coordinates for the second burn and translunar phases of flight.

TABLE B-I. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S	ODXE M/S SQ	DDYE M/S SQ	DDZE M/S SQ
GUIDANCE REFERENCE RELEASE									
-16.939	112	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-16.0	112	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-15.0	112	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-14.0	112	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-13.0	112	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-12.0	112	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-11.0	112	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-10.0	112	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-9.0	112	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-8.0	112	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-7.0	112	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-6.0	112	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-5.0	112	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-4.0	112	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-3.0	112	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-2.0	112	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-1.0	112	0	0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	112	0	0	0.0	0.0	0.0	0.0	0.0	0.0
ALL HOLDDOWN ARMS RELEASED									
0.300	112	0	0	0.1	-0.0	-0.0	0.82	-0.00	-0.00
LIFTOFF - START OF TIME BASE 1									
0.600	112	0	0	0.5	-0.0	-0.0	1.12	0.00	-0.00
1.0	112	0	0	1.1	0.0	-0.0	2.24	0.03	-0.03
2.0	114	0	0	3.5	0.0	-0.0	2.34	0.06	-0.03
3.0	119	0	0	5.8	0.1	-0.1	2.39	0.07	-0.03
4.0	126	0	0	8.2	0.2	-0.1	2.45	0.11	-0.03
5.0	136	1	0	10.7	0.3	-0.1	2.51	0.12	-0.03
6.0	148	1	0	13.3	0.4	-0.2	2.56	0.14	-0.04
7.0	162	1	-1	15.9	0.6	-0.2	2.62	0.27	-0.07
8.0	179	2	-1	18.5	0.9	-0.3	2.69	0.31	-0.07
9.0	199	3	-1	21.3	1.2	-0.3	2.79	0.27	-0.05
10.0	222	5	-2	24.1	1.4	-0.4	2.87	0.16	-0.02
11.0	247	6	-2	27.0	1.5	-0.4	2.95	0.07	0.01
12.0	276	8	-2	30.0	1.6	-0.4	3.00	0.06	0.04
13.0	307	9	-3	33.0	1.7	-0.3	3.01	0.09	0.06
14.0	342	11	-3	36.0	1.8	-0.2	3.06	0.10	0.09

TABLE B-1. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S	DOXE M/S SQ	DDYE M/S SQ	DDZE M/S SQ
15.0	379	13	-3	39.1	1.8	-0.1	3.13	0.06	0.10
16.0	420	15	-3	42.3	1.9	-0.0	3.21	-0.02	0.11
17.0	464	16	-3	45.5	1.8	0.1	3.27	-0.09	0.14
18.0	511	18	-3	48.8	1.7	0.2	3.34	-0.09	0.17
19.0	562	20	-3	52.2	1.6	0.4	3.41	-0.07	0.21
20.0	616	21	-2	55.6	1.6	0.7	3.48	-0.05	0.23
21.0	673	23	-1	59.2	1.5	0.9	3.56	-0.03	0.26
22.0	734	25	0	62.8	1.5	1.2	3.63	-0.04	0.31
23.0	799	26	1	66.4	1.4	1.5	3.71	-0.03	0.35
24.0	867	27	3	70.2	1.4	1.9	3.78	-0.04	0.41
25.0	939	29	5	74.0	1.4	2.3	3.85	-0.05	0.47
26.0	1015	30	7	77.9	1.3	2.8	3.93	-0.06	0.55
27.0	1095	31	11	81.9	1.2	3.4	4.01	-0.06	0.63
28.0	1179	33	14	85.9	1.2	4.1	4.08	-0.06	0.72
29.0	1267	34	19	90.0	1.1	4.9	4.17	-0.06	0.81
30.0	1359	35	24	94.2	1.1	5.7	4.25	-0.06	0.90
31.0	1455	36	30	98.5	1.0	6.7	4.33	-0.06	1.00
32.0	1556	37	37	102.9	0.9	7.7	4.41	-0.07	1.11
33.0	1661	38	46	107.3	0.9	8.9	4.49	-0.07	1.23
34.0	1770	39	55	111.9	0.8	10.2	4.58	-0.07	1.35
35.0	1885	39	66	116.5	0.7	11.6	4.66	-0.07	1.47
36.0	2003	40	78	121.2	0.7	13.1	4.74	-0.07	1.60
37.0	2127	41	92	126.0	0.6	14.8	4.83	-0.06	1.74
38.0	2255	41	108	130.9	0.5	16.6	4.91	-0.06	1.89
39.0	2389	42	126	135.8	0.5	18.6	4.99	-0.06	2.04
40.0	2527	42	145	140.8	0.4	20.7	5.07	-0.06	2.20
41.0	2670	43	167	145.9	0.3	23.0	5.15	-0.07	2.36
42.0	2819	43	191	151.1	0.3	25.4	5.23	-0.07	2.54
43.0	2973	43	218	156.4	0.2	28.0	5.31	-0.07	2.72
44.0	3132	43	248	161.8	0.1	30.9	5.39	-0.08	2.90
45.0	3296	43	280	167.2	0.1	33.9	5.46	-0.08	3.09
46.0	3466	43	315	172.7	-0.0	37.0	5.54	-0.08	3.29
47.0	3642	43	354	178.3	-0.1	40.4	5.60	-0.07	3.49
48.0	3823	43	396	183.9	-0.2	44.0	5.67	-0.06	3.69
49.0	4010	43	442	189.6	-0.2	47.8	5.74	-0.05	3.90
50.0	4202	43	492	195.4	-0.2	51.8	5.81	-0.03	4.11
51.0	4400	43	546	201.2	-0.3	56.0	5.89	-0.02	4.32
52.0	4605	42	604	207.2	-0.3	60.5	5.96	-0.00	4.54
53.0	4815	42	667	213.2	-0.3	65.1	6.03	0.01	4.76
54.0	5031	42	734	219.2	-0.3	70.0	6.09	0.01	4.99
55.0	5253	42	807	225.3	-0.3	75.1	6.14	0.02	5.23
56.0	5482	41	885	231.5	-0.2	80.4	6.20	0.01	5.46
57.0	5716	41	968	237.7	-0.2	86.0	6.26	0.01	5.69



TABLE B-I. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S	DDXE M/S SQ	DDYE M/S SQ	DDZE M/S SQ
58.0	5957	41	1057	244.0	-0.2	91.8	6.31	0.00	5.92
59.0	6204	41	1152	250.3	-0.2	97.9	6.35	-0.02	6.17
60.0	6458	40	1253	256.7	-0.3	104.2	6.39	-0.03	6.41
61.0	6718	40	1360	263.1	-0.3	110.7	6.43	-0.05	6.64
62.0	6984	40	1474	269.6	-0.4	117.4	6.45	-0.06	6.87
63.0	7257	39	1595	276.0	-0.4	124.4	6.46	-0.05	7.09
64.0	7536	39	1723	282.5	-0.4	131.6	6.47	-0.04	7.31
MACH 1									
65.000	7822	38	1858	289.0	-0.5	139.0	6.48	-0.01	7.53
66.0	8114	38	2001	295.4	-0.5	146.7	6.49	0.01	7.75
67.0	8413	38	2152	301.9	-0.5	154.5	6.51	0.03	7.97
68.0	8718	37	2310	308.5	-0.4	162.6	6.54	0.04	8.20
69.0	9030	37	2477	315.0	-0.4	171.0	6.58	0.04	8.46
70.0	9348	36	2652	321.6	-0.3	179.5	6.63	0.03	8.72
71.0	9673	36	2836	328.3	-0.3	188.4	6.67	0.02	8.97
72.0	10004	36	3029	335.0	-0.3	197.5	6.77	0.01	9.23
73.0	10343	35	3231	341.8	-0.3	206.8	6.85	0.00	9.47
74.0	10688	35	3443	348.7	-0.3	216.4	6.93	-0.00	9.72
75.0	11040	35	3664	355.7	-0.3	226.2	7.01	0.01	9.96
76.0	11399	35	3895	362.7	-0.3	236.3	7.07	0.04	10.19
77.0	11766	34	4137	369.8	-0.2	246.6	7.13	0.07	10.44
78.0	12139	34	4389	377.0	-0.1	257.2	7.18	0.12	10.70
79.0	12520	34	4651	384.2	0.1	268.1	7.22	0.17	10.99
80.0	12907	34	4925	391.4	0.2	279.2	7.26	0.22	11.30
81.0	13303	35	5210	398.7	0.5	290.7	7.28	0.26	11.64
MAXIMUM DYNAMIC PRESSURE									
82.000	13705	35	5507	406.0	0.7	302.5	7.29	0.26	12.01
83.0	14114	36	5815	413.3	1.0	314.7	7.29	0.24	12.40
84.0	14531	37	6136	420.5	1.2	327.3	7.28	0.20	12.81
85.0	14956	38	6470	427.8	1.4	340.4	7.25	0.16	13.22
86.0	15387	40	6817	435.0	1.5	353.8	7.22	0.11	13.63
87.0	15826	41	7178	442.2	1.6	367.6	7.19	0.08	14.01
88.0	16271	43	7552	449.4	1.7	381.8	7.18	0.05	14.37
89.0	16724	45	7941	456.6	1.7	396.3	7.18	0.04	14.72
90.0	17185	47	8345	463.8	1.8	411.2	7.21	0.04	15.04
91.0	17652	48	8764	471.0	1.8	426.4	7.25	0.05	15.36
92.0	18127	50	9198	478.3	1.9	441.9	7.29	0.05	15.66
93.0	18609	52	9648	485.6	1.9	457.7	7.34	0.04	15.96
94.0	19098	54	10113	493.0	1.9	473.8	7.38	0.03	16.27

TABLE B-1. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S	DDXE M/S SQ	DDYE M/S SQ	DDZE M/S SQ
95.0	19595	56	10595	500.4	2.0	490.2	7.42	0.01	16.57
96.0	20099	58	11094	507.8	1.9	507.0	7.45	-0.02	16.88
97.0	20610	60	11610	515.3	1.9	524.0	7.47	-0.05	17.20
98.0	21129	62	12142	522.7	1.9	541.4	7.49	-0.07	17.53
99.0	21656	64	12692	530.2	1.8	559.1	7.50	-0.08	17.87
100.0	22190	65	13260	537.7	1.7	577.1	7.51	-0.08	18.22
101.0	22731	67	13847	545.3	1.6	595.5	7.53	-0.06	18.56
102.0	23280	69	14452	552.8	1.6	614.2	7.54	-0.06	18.90
103.0	23837	70	15075	560.3	1.6	633.3	7.55	-0.03	19.24
104.0	24401	72	15718	567.9	1.6	652.7	7.57	0.05	19.56
105.0	24973	73	16381	575.5	1.7	672.4	7.59	0.08	19.89
106.0	25552	75	17063	583.1	1.8	692.5	7.61	0.11	20.20
107.0	26139	77	17766	590.7	1.9	712.8	7.65	0.11	20.52
108.0	26733	79	18489	598.4	2.0	733.5	7.70	0.11	20.83
109.0	27336	81	19233	606.1	2.1	754.5	7.76	0.10	21.15
110.0	27946	83	19998	613.9	2.2	775.8	7.83	0.08	21.47
111.0	28563	85	20785	621.8	2.3	797.4	7.91	0.06	21.78
112.0	29189	88	21593	629.7	2.3	819.4	7.98	0.06	22.10
113.0	29823	90	22424	637.7	2.4	841.6	8.04	0.06	22.42
114.0	30465	92	23277	645.8	2.5	864.2	8.09	0.07	22.76
115.0	31115	95	24152	653.9	2.5	887.2	8.12	0.08	23.11
116.0	31773	98	25051	662.0	2.6	910.5	8.12	0.10	23.48
117.0	32439	100	25973	670.1	2.7	934.1	8.12	0.11	23.87
118.0	33113	103	26919	678.2	2.8	958.2	8.11	0.10	24.27
119.0	33795	106	27890	686.3	2.9	982.7	8.09	0.09	24.69
120.0	34485	109	28885	694.4	3.0	1007.6	8.09	0.07	25.12
121.0	35184	112	29905	702.5	3.1	1032.9	8.08	0.05	25.52
122.0	35891	115	30951	710.6	3.1	1058.7	8.09	0.04	25.95
123.0	36605	118	32023	718.7	3.1	1084.9	8.11	0.03	26.38
124.0	37328	121	33121	726.8	3.2	1111.5	8.14	0.03	26.81
125.0	38059	124	34246	735.0	3.2	1138.5	8.18	0.03	27.24
126.0	38798	128	35398	743.2	3.2	1166.0	8.23	0.04	27.67
127.0	39545	131	36578	751.5	3.3	1193.9	8.29	0.05	28.10
128.0	40301	134	37786	759.8	3.3	1222.2	8.35	0.03	28.53
129.0	41065	137	39022	768.2	3.4	1251.0	8.42	0.08	28.98
130.0	41837	141	40288	776.6	3.5	1280.2	8.48	0.08	29.43
131.0	42618	144	41583	785.1	3.5	1309.8	8.55	0.07	29.88
132.0	43408	148	42908	793.7	3.6	1339.9	8.62	0.09	30.34
133.0	44206	152	44263	802.4	3.7	1370.5	8.69	0.06	30.82
134.0	45012	155	45649	811.1	3.7	1401.6	8.77	0.05	31.30
135.0	45828	159	47066	819.9	3.8	1433.1	8.85	0.08	31.78
135.960	46619	163	48458	828.4	3.9	1463.8	8.92	0.10	32.24

S-1C CENTER ENGINE CUTOFF (ENGINE SOLENOID)

TABLE B-I. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S	DDXE M/S SQ	DDYE M/S SQ	DDZE M/S SQ
136.0	46652	163	48516	828.8	3.9	1465.1	8.93	0.10	32.26
137.0	47484	167	49996	835.2	4.0	1493.2	5.35	0.06	26.19
138.0	48321	171	51500	840.5	4.0	1519.4	5.37	0.05	26.15
139.0	49164	175	53033	845.9	4.1	1545.6	5.41	0.11	26.36
140.0	50013	179	54592	851.3	4.2	1572.1	5.47	0.11	26.68
141.0	50866	183	56177	856.8	4.3	1599.0	5.53	0.12	27.04
142.0	51726	188	57790	862.4	4.5	1626.2	5.59	0.12	27.43
143.0	52591	192	59430	868.0	4.6	1653.9	5.65	0.11	27.83
144.0	53461	197	61098	873.7	4.7	1682.0	5.72	0.11	28.25
145.0	54338	202	62794	879.5	4.8	1710.4	5.78	0.11	28.66
146.0	55220	206	64519	885.3	4.9	1739.3	5.84	0.11	29.07
147.0	56108	211	66272	891.0	5.0	1768.6	5.90	0.12	29.50
148.0	57002	216	68056	896.9	5.1	1798.3	5.95	0.12	29.92
149.0	57902	222	69869	902.9	5.2	1828.4	6.01	0.13	30.34
150.0	58808	227	71713	909.0	5.4	1858.9	6.07	0.13	30.76
151.0	59720	232	73587	915.1	5.5	1889.9	6.14	0.14	31.19
152.0	60638	238	75493	921.2	5.6	1921.4	6.21	0.14	31.66
153.0	61562	244	77430	927.5	5.8	1953.3	6.24	0.14	32.13
154.0	62493	249	79399	933.8	5.9	1985.6	6.32	0.14	32.60
155.0	63430	255	81401	940.1	6.1	2018.5	6.40	0.19	33.08
156.0	64373	262	83436	946.5	6.3	2051.8	6.48	0.14	33.55
157.0	65323	268	85505	953.1	6.4	2085.6	6.56	0.16	34.02
158.0	66280	274	87607	959.7	6.6	2119.9	6.65	0.18	34.50
159.0	67243	281	89745	966.4	6.7	2154.6	6.73	0.16	34.97
S-IC OUTBOARD ENGINE CUTOFF (ENGINE SOLENOID)									
159.560	67785	285	90956	970.1	6.8	2174.3	6.77	0.18	35.23
160.0	58211	288	91913	970.2	6.9	2182.9	-6.51	0.16	4.24
161.0	69177	295	94096	961.8	7.1	2184.3	-9.47	0.13	-0.38
S-IC/S-II SEPARATION COMMAND									
161.200	69369	296	94533	959.9	7.1	2184.2	-9.46	0.13	-0.38
162.0	70134	302	96279	952.4	7.2	2183.9	-9.40	0.13	-0.36
164.0	72021	317	100648	934.2	7.5	2184.0	-8.62	0.13	1.93
166.0	73874	332	105024	919.5	7.7	2192.4	-6.83	0.15	4.95
168.0	75700	348	109418	906.2	8.1	2202.8	-6.16	0.17	6.18
170.0	77500	364	113836	894.0	8.4	2215.9	-6.07	0.18	6.57
172.0	79276	381	118281	881.8	8.8	2228.9	-5.97	0.19	6.79
174.0	81027	399	122752	869.9	9.2	2242.6	-5.94	0.19	6.82
176.0	82755	418	127251	858.1	9.5	2256.3	-5.93	0.20	6.85
178.0	84460	437	131778	846.3	9.9	2270.0	-5.90	0.20	6.88

TABLE B-I. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XE M	YE M	ZE M	DYE M/S	DYE M/S	DZE M/S	DDXE M/S <sup>2</sup>	DDYE M/S <sup>2</sup>	DDZE M/S <sup>2</sup>
180.0	86141	458	136331	834.5	10.3	2283.8	-5.87	0.20	6.91
182.0	87798	479	140913	822.8	10.7	2297.6	-5.85	0.20	6.93
184.0	89432	501	145522	811.1	11.1	2311.5	-5.83	0.20	6.97
186.0	91042	523	150159	799.5	11.6	2325.5	-5.81	0.20	6.99
188.0	92629	547	154824	787.9	12.0	2339.5	-5.78	0.21	7.02
190.0	94194	571	159517	776.3	12.4	2353.6	-5.76	0.21	7.06
192.0	95735	596	164238	764.8	12.8	2367.7	-5.73	0.21	7.09
194.0	97253	622	168988	753.4	13.2	2381.9	-5.69	0.22	7.13
196.0	98749	649	173766	742.1	13.7	2396.2	-5.66	0.22	7.17
198.0	100221	677	178573	730.8	14.1	2410.6	-5.63	0.22	7.22
200.0	101672	706	183409	719.5	14.5	2425.1	-5.60	0.22	7.24
202.0	103100	735	188273	708.3	15.0	2439.6	-5.60	0.22	7.27
204.0	104505	765	193167	697.1	15.4	2454.2	-5.66	0.23	7.33
206.0	105888	797	198090	685.7	15.9	2469.0	-5.78	0.24	7.42
208.0	107247	829	203043	673.9	16.4	2483.9	-5.94	0.26	7.53
210.0	108583	862	208026	661.9	16.9	2499.1	-6.07	0.26	7.62
212.0	109895	897	213039	649.7	17.4	2514.4	-6.14	0.27	7.68
214.0	111182	932	218084	637.4	18.0	2529.8	-6.14	0.26	7.72
216.0	112445	969	223159	625.2	18.5	2545.3	-6.13	0.27	7.75
218.0	113683	1006	228265	612.9	19.0	2560.8	-6.12	0.27	7.78
220.0	114896	1045	233402	600.7	19.6	2576.4	-6.12	0.28	7.81
222.0	116085	1085	238570	588.4	20.2	2592.0	-6.12	0.29	7.84
224.0	117250	1125	243770	576.2	20.7	2607.8	-6.11	0.29	7.88
226.0	118390	1167	249001	564.0	21.3	2623.6	-6.11	0.29	7.92
228.0	119506	1211	254264	551.8	21.9	2639.4	-6.10	0.29	7.95
230.0	120597	1255	259559	539.6	22.5	2655.4	-6.10	0.30	7.99
232.0	121664	1301	264886	527.4	23.1	2671.4	-6.10	0.29	8.03
234.0	122707	1347	270245	515.2	23.6	2687.5	-6.09	0.28	8.07
236.0	123725	1395	275636	503.0	24.2	2703.7	-6.08	0.28	8.11
238.0	124719	1444	281059	490.8	24.8	2719.9	-6.08	0.28	8.15
240.0	125688	1494	286516	478.7	25.3	2736.3	-6.09	0.29	8.19
242.0	126633	1545	292005	466.5	25.9	2752.7	-6.09	0.29	8.22
244.0	127554	1598	297526	454.3	26.5	2769.1	-6.10	0.29	8.26
246.0	128451	1651	303081	442.1	27.1	2785.7	-6.09	0.28	8.30
248.0	129323	1706	308669	429.9	27.6	2802.3	-6.09	0.29	8.34
250.0	130170	1762	314291	417.7	28.2	2819.1	-6.09	0.29	8.38
252.0	130994	1819	319945	405.6	28.8	2835.9	-6.08	0.29	8.41
254.0	131792	1877	325634	393.4	29.4	2852.7	-6.08	0.29	8.45
256.0	132567	1936	331356	381.2	30.0	2869.7	-6.08	0.30	8.49
258.0	133317	1997	337113	369.1	30.6	2886.7	-6.09	0.30	8.53
260.0	134043	2059	342903	356.9	31.2	2903.8	-6.09	0.30	8.57
262.0	134745	2121	348728	344.7	31.8	2921.0	-6.08	0.30	8.61
264.0	135422	2186	354587	332.6	32.4	2938.2	-6.08	0.31	8.66

TABLE B-I. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S	DDXE M/S <sup>2</sup>	DDYE M/S <sup>2</sup>	DDZE M/S <sup>2</sup>
266.0	136075	2251	360481	320.4	33.0	2955.6	-6.08	0.31	8.70
268.0	136704	2318	366410	308.2	33.6	2973.0	-6.08	0.31	8.74
270.0	137308	2385	372373	296.1	34.2	2990.6	-6.08	0.31	8.78
272.0	137888	2454	378372	283.9	34.9	3008.2	-6.08	0.32	8.82
274.0	138444	2525	384406	271.8	35.5	3025.8	-6.08	0.32	8.87
276.0	138975	2596	390475	259.6	36.1	3043.6	-6.09	0.31	8.91
278.0	139482	2669	396581	247.4	36.8	3061.5	-6.09	0.31	8.96
280.0	139965	2744	402721	235.2	37.4	3079.5	-6.09	0.32	9.00
282.0	140423	2819	408898	223.0	38.0	3097.5	-6.09	0.33	9.05
284.0	140857	2896	415112	210.9	38.7	3115.6	-6.09	0.32	9.09
286.0	141266	2974	421361	198.7	39.3	3133.9	-6.09	0.32	9.13
288.0	141651	3053	427647	186.5	40.0	3152.2	-6.10	0.33	9.18
290.0	142012	3134	433970	174.3	40.7	3170.6	-6.11	0.34	9.23
292.0	142349	3216	440330	162.1	41.3	3189.1	-6.11	0.33	9.28
294.0	142661	3299	446726	149.8	42.0	3207.7	-6.11	0.34	9.33
296.0	142948	3384	453161	137.6	42.7	3226.4	-6.11	0.34	9.38
298.0	143211	3470	459632	125.4	43.4	3245.2	-6.11	0.35	9.43
300.0	143450	3557	466142	113.2	44.1	3264.1	-6.11	0.35	9.47
302.0	143664	3646	472689	100.9	44.8	3283.1	-6.12	0.35	9.52
304.0	143853	3737	479274	88.7	45.5	3302.2	-6.13	0.35	9.57
306.0	144018	3828	485898	76.4	46.2	3321.4	-6.13	0.35	9.63
308.0	144159	3921	492560	64.2	46.9	3340.7	-6.13	0.36	9.68
310.0	144275	4016	499261	51.9	47.6	3360.1	-6.14	0.36	9.73
312.0	144367	4112	506000	39.6	48.3	3379.6	-6.15	0.36	9.78
314.0	144433	4209	512779	27.3	49.1	3399.2	-6.15	0.36	9.83
316.0	144476	4308	519597	15.0	49.8	3419.0	-6.15	0.37	9.89
318.0	144493	4408	526455	2.7	50.6	3438.8	-6.16	0.38	9.94
320.0	144487	4510	533353	-9.6	51.3	3458.7	-6.17	0.38	10.00
322.0	144455	4614	540290	-22.0	52.1	3478.8	-6.18	0.38	10.05
324.0	144399	4718	547268	-34.4	52.8	3498.9	-6.18	0.38	10.10
326.0	144317	4825	554286	-46.7	53.6	3519.2	-6.19	0.38	10.16
328.0	144212	4933	561345	-59.1	54.3	3539.6	-6.20	0.39	10.22
330.0	144081	5042	568444	-71.5	55.1	3560.1	-6.20	0.39	10.28
332.0	143925	5153	575585	-83.9	55.9	3580.7	-6.21	0.39	10.34
334.0	143745	5266	582767	-96.4	56.7	3601.4	-6.21	0.40	10.39
336.0	143540	5380	589991	-108.8	57.5	3622.3	-6.23	0.40	10.45
338.0	143310	5496	597257	-121.3	58.3	3643.3	-6.24	0.40	10.52
340.0	143055	5613	604564	-133.7	59.1	3664.4	-6.25	0.41	10.58
342.0	142775	5732	611914	-146.3	59.9	3685.6	-6.26	0.41	10.64
344.0	142470	5853	619307	-158.8	60.7	3706.9	-6.26	0.41	10.70
346.0	142140	5975	626742	-171.3	61.6	3728.4	-6.28	0.41	10.76
348.0	141785	6099	634220	-183.9	62.4	3750.0	-6.29	0.42	10.83
350.0	141404	6225	641742	-196.5	63.3	3771.7	-6.30	0.43	10.90

TABLE B-1. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S	DDXE M/S SQ	DDYE M/S SQ	DDZE M/S SQ
352.0	140999	6352	649307	-209.1	64.1	3793.6	-6.31	0.44	10.96
354.0	140568	6481	656916	-221.7	65.0	3815.5	-6.31	0.44	11.02
356.0	140112	6612	664569	-234.3	65.9	3837.7	-6.32	0.44	11.09
358.0	139631	6745	672267	-247.0	66.8	3859.9	-6.33	0.45	11.16
360.0	139124	6879	680009	-259.6	67.7	3882.3	-6.34	0.45	11.23
362.0	138592	7016	687796	-272.3	68.6	3904.8	-6.36	0.46	11.30
364.0	138035	7154	695628	-285.1	69.5	3927.5	-6.38	0.47	11.37
366.0	137452	7294	703506	-297.9	70.4	3950.3	-6.39	0.47	11.44
368.0	136843	7435	711430	-310.7	71.4	3973.2	-6.40	0.46	11.51
370.0	136209	7579	719399	-323.5	72.3	3996.3	-6.42	0.46	11.58
372.0	135549	7725	727415	-336.3	73.2	4019.6	-6.43	0.46	11.65
374.0	134864	7872	735477	-349.2	74.1	4042.9	-6.44	0.47	11.73
376.0	134152	8021	743587	-362.1	75.1	4066.5	-6.46	0.48	11.81
378.0	133415	8172	751743	-375.0	76.0	4090.2	-6.48	0.48	11.88
380.0	132652	8325	759948	-388.0	77.0	4114.0	-6.50	0.49	11.96
382.0	131863	8480	768200	-401.0	78.0	4138.0	-6.51	0.49	12.04
384.0	131048	8637	776500	-414.1	79.0	4162.2	-6.53	0.49	12.12
386.0	130207	8796	784848	-427.2	80.0	4186.5	-6.55	0.50	12.20
388.0	129340	8957	793246	-440.3	80.9	4210.9	-6.56	0.50	12.28
390.0	128446	9120	801692	-453.4	81.9	4235.6	-6.58	0.50	12.36
392.0	127526	9285	810188	-466.6	82.9	4260.4	-6.59	0.51	12.44
394.0	126580	9452	818734	-479.8	84.0	4285.4	-6.61	0.51	12.52
396.0	125607	9621	827330	-493.0	85.0	4310.5	-6.64	0.51	12.62
398.0	124607	9791	835976	-506.3	86.0	4335.8	-6.66	0.51	12.71
400.0	123581	9964	844673	-519.7	87.0	4361.3	-6.69	0.51	12.79
402.0	122529	10140	853421	-533.0	88.0	4387.0	-6.70	0.51	12.88
404.0	121449	10317	862221	-546.5	89.1	4412.8	-6.71	0.52	12.96
406.0	120343	10496	871073	-559.9	90.1	4438.8	-6.73	0.52	13.05
408.0	119210	10677	879977	-573.4	91.2	4465.0	-6.76	0.53	13.15
410.0	118049	10860	888933	-586.9	92.2	4491.4	-6.78	0.53	13.25
412.0	116862	11046	897942	-600.5	93.3	4518.0	-6.81	0.53	13.35
414.0	115647	11233	907005	-614.2	94.3	4544.8	-6.83	0.54	13.44
416.0	114405	11423	916122	-627.9	95.4	4571.8	-6.85	0.55	13.53
418.0	113136	11615	925292	-641.6	96.5	4598.9	-6.86	0.56	13.63
420.0	111839	11809	934518	-655.3	97.7	4626.3	-6.88	0.56	13.73
422.0	110514	12006	943798	-669.1	98.8	4653.9	-6.92	0.56	13.84
424.0	109162	12205	953133	-683.0	99.9	4681.6	-6.95	0.56	13.94
426.0	107782	12406	962524	-696.9	101.0	4709.6	-6.98	0.57	14.04
428.0	106375	12609	971972	-710.9	102.2	4737.8	-7.00	0.57	14.15
430.0	104939	12814	981476	-724.9	103.3	4766.2	-7.02	0.57	14.26
432.0	103475	13022	991037	-739.0	104.5	4794.9	-7.05	0.58	14.37
434.0	101983	13232	1000655	-753.1	105.7	4823.7	-7.07	0.59	14.47
436.0	100462	13445	1010332	-767.3	106.9	4852.7	-7.10	0.60	14.58

TABLE B-I. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S	DDXE M/S <sup>2</sup>	DDYE M/S <sup>2</sup>	DDZE M/S <sup>2</sup>
438.0	98914	13660	1020067	-781.5	108.1	4882.0	-7.14	0.60	14.70
440.0	97336	13877	1029860	-795.8	109.3	4911.6	-7.17	0.60	14.82
442.0	95730	14097	1039713	-810.2	110.5	4941.3	-7.20	0.61	14.94
444.0	94096	14319	1049625	-824.6	111.7	4971.3	-7.22	0.62	15.06
446.0	92432	14544	1059598	-839.1	112.9	5001.6	-7.25	0.62	15.18
448.0	90739	14771	1069632	-853.6	114.2	5032.0	-7.28	0.63	15.30
450.0	89017	15000	1079727	-868.2	115.5	5062.8	-7.31	0.63	15.43
452.0	87266	15233	1089883	-882.8	116.7	5093.7	-7.34	0.64	15.55
454.0	85486	15467	1100102	-897.6	118.0	5125.0	-7.38	0.65	15.68
456.0	83676	15705	1110383	-912.4	119.3	5156.4	-7.42	0.66	15.81
458.0	81837	15945	1120728	-927.2	120.6	5188.2	-7.45	0.65	15.94
459.560	80381	16134	1128841	-938.9	121.6	5213.1	-7.47	0.63	16.04
460.0	79967	16187	1131136	-942.2	121.9	5219.5	-7.60	0.61	12.85
462.0	78068	16432	1141600	-957.5	123.1	5244.8	-7.72	0.56	12.68
464.0	76137	16679	1152115	-973.0	124.2	5270.2	-7.74	0.55	12.73
466.0	74176	16929	1162681	-988.4	125.3	5295.7	-7.70	0.58	12.79
468.0	72183	17180	1173298	-1003.7	126.4	5321.4	-7.59	0.59	12.86
470.0	70161	17435	1183967	-1018.7	127.6	5347.2	-7.31	0.59	12.93
472.0	68109	17691	1194688	-1032.9	128.8	5373.1	-6.89	0.60	13.00
474.0	66030	17950	1205460	-1046.3	130.0	5399.4	-6.55	0.57	13.08
476.0	63924	18211	1216285	-1059.3	131.1	5425.7	-6.45	0.60	13.16
478.0	61793	18474	1227163	-1072.2	132.3	5452.0	-6.50	0.61	13.24
480.0	59635	18740	1238094	-1085.3	133.5	5478.6	-6.56	0.58	13.32
482.0	57451	19008	1249078	-1098.4	134.7	5505.3	-6.61	0.64	13.39
484.0	55240	19279	1260116	-1111.7	136.0	5532.2	-6.65	0.61	13.48
486.0	53003	19552	1271205	-1125.5	137.2	5556.1	-7.09	0.59	11.70
488.0	50737	19828	1282341	-1139.9	138.4	5579.5	-7.22	0.62	11.70
490.0	48443	20106	1293524	-1154.4	139.6	5602.9	-7.28	0.62	11.75
492.0	46120	20386	1304754	-1169.0	140.9	5626.5	-7.33	0.63	11.81
494.0	43767	20670	1316031	-1183.7	142.2	5650.4	-7.39	0.63	11.87
496.0	41385	20955	1327355	-1198.5	143.4	5674.2	-7.48	0.64	11.95
498.0	38973	21243	1338728	-1213.6	144.7	5698.2	-7.63	0.65	12.02
500.0	36530	21534	1350148	-1229.1	146.0	5722.3	-7.81	0.66	12.10
502.0	34056	21827	1361617	-1244.9	147.3	5746.6	-7.95	0.67	12.19
504.0	31550	22123	1373134	-1260.8	148.7	5771.0	-8.02	0.68	12.26
506.0	29013	22422	1384701	-1276.9	150.0	5795.6	-8.06	0.68	12.34
508.0	26443	22723	1396317	-1293.1	151.4	5820.4	-8.11	0.68	12.42
510.0	23840	23028	1407983	-1309.4	152.8	5845.3	-8.17	0.68	12.51
512.0	21205	23335	1419698	-1325.8	154.1	5870.4	-8.22	0.68	12.60
514.0	18537	23644	1431464	-1342.2	155.5	5895.7	-8.26	0.69	12.67

## S-II CENTER ENGINE CUTOFF (ENGINE SOLENOID)

TABLE B-1. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S	DDXE M/S SQ	DDYE M/S SQ	DDZE M/S SQ
S-II OUTBOARD ENGINE CUTOFF (ENGINE SOLENOID)									
549.060	-33750	29541	1646274	-1644.6	181.4	6368.7	-8.98	0.64	14.52
550.0	-35299	29712	1652257	-1652.8	181.9	6370.7	-8.12	0.54	-2.93
S-II/S-IVB SEPARATION COMMAND									
550.100	-35464	29730	1652894	-1653.7	182.0	6370.4	-8.12	0.53	-2.93
552.0	-38620	30077	1664989	-1669.1	182.9	6364.8	-8.12	0.43	-2.93
554.0	-41974	30444	1677712	-1685.3	183.7	6359.4	-8.17	0.43	-1.26
556.0	-45361	30812	1690432	-1701.9	184.6	6362.0	-8.38	0.49	2.63
558.0	-48781	31182	1703161	-1718.7	185.7	6367.6	-8.38	0.52	2.92
560.0	-52235	31555	1715902	-1735.5	186.7	6373.4	-8.45	0.50	2.97
562.0	-55722	31929	1728655	-1752.6	187.7	6379.4	-8.57	0.49	3.02
564.0	-59244	32305	1741420	-1769.6	188.6	6385.4	-8.62	0.49	3.02
566.0	-62800	32683	1754197	-1786.8	189.6	6391.5	-8.61	0.51	3.04
568.0	-66391	33064	1766986	-1804.0	190.7	6397.6	-8.59	0.51	3.04
570.0	-70016	33446	1779787	-1821.2	191.7	6403.6	-8.62	0.52	3.05
572.0	-73676	33831	1792600	-1838.5	192.8	6409.8	-8.67	0.54	3.05
574.0	-77370	34217	1805426	-1855.9	193.8	6415.8	-8.71	0.55	3.04
576.0	-81100	34606	1818264	-1873.3	194.9	6421.9	-8.73	0.56	3.03
578.0	-84864	34997	1831114	-1890.8	196.1	6428.0	-8.75	0.57	3.03
580.0	-88663	35390	1843976	-1908.3	197.2	6434.0	-8.77	0.58	3.02
582.0	-92497	35786	1856850	-1925.9	198.4	6440.1	-8.78	0.58	3.01
584.0	-96366	36184	1869736	-1943.4	199.5	6446.1	-8.79	0.58	3.01



TABLE B-I. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S	DDXE M/S SQ	DDYE M/S SQ	DDZE M/S SQ
586.0	-100271	36584	1882634	-1961.0	200.7	6452.1	-8.80	0.59	3.02
588.0	-104210	36987	1895544	-1978.6	201.9	6458.2	-8.80	0.59	3.02
590.0	-108185	37392	1908467	-1996.2	203.1	6464.2	-8.80	0.59	3.02
592.0	-112195	37799	1921401	-2013.8	204.3	6470.3	-8.79	0.59	3.02
594.0	-116240	38209	1934348	-2031.4	205.5	6476.3	-8.80	0.60	3.02
596.0	-120321	38621	1947306	-2049.0	206.7	6482.3	-8.82	0.61	3.02
598.0	-124437	39035	1960277	-2066.7	207.9	6488.4	-8.84	0.61	3.03
600.0	-128588	39452	1973260	-2084.4	209.1	6494.5	-8.85	0.61	3.03
602.0	-132774	39872	1986255	-2102.1	210.3	6500.5	-8.86	0.61	3.02
604.0	-136996	40293	1999262	-2119.9	211.5	6506.5	-8.88	0.61	3.01
606.0	-141254	40718	2012281	-2137.6	212.7	6512.6	-8.88	0.61	3.00
608.0	-145547	41144	2025312	-2155.4	214.0	6518.6	-8.89	0.61	3.00
610.0	-149875	41574	2038355	-2173.2	215.2	6524.5	-8.89	0.61	2.99
612.0	-154239	42005	2051410	-2190.9	216.4	6530.5	-8.89	0.61	2.98
614.0	-158639	42439	2064477	-2208.7	217.6	6536.5	-8.90	0.61	2.99
616.0	-163074	42876	2077556	-2226.5	218.8	6542.5	-8.89	0.62	3.00
618.0	-167545	43315	2090647	-2244.3	220.1	6548.5	-8.89	0.62	3.01
620.0	-172052	43756	2103750	-2262.1	221.3	6554.5	-8.89	0.61	3.01
622.0	-176594	44200	2116865	-2279.7	222.5	6560.5	-8.90	0.60	2.99
624.0	-181171	44646	2129992	-2297.7	223.7	6566.5	-8.92	0.60	2.97
626.0	-185784	45095	2143131	-2315.5	224.9	6572.4	-8.93	0.60	2.97
628.0	-190433	45546	2156282	-2333.4	226.1	6578.3	-8.94	0.60	2.97
630.0	-195118	45999	2169444	-2351.3	227.3	6584.3	-8.95	0.60	2.97
632.0	-199839	46455	2182619	-2369.2	228.5	6590.2	-8.95	0.60	2.96
634.0	-204595	46913	2195805	-2387.1	229.7	6596.1	-8.94	0.60	2.96
636.0	-209387	47374	2209004	-2405.0	230.9	6602.1	-8.93	0.61	2.97
638.0	-214215	47837	2222214	-2422.8	232.2	6608.0	-8.92	0.61	2.96
640.0	-219078	48303	2235436	-2440.7	233.4	6613.9	-8.93	0.60	2.95
642.0	-223978	48770	2248669	-2458.5	234.6	6619.8	-8.94	0.59	2.95
644.0	-228913	49241	2261915	-2476.4	235.7	6625.7	-8.95	0.60	2.95
646.0	-233883	49713	2275172	-2494.3	236.9	6631.6	-8.96	0.60	2.96
648.0	-238890	50189	2288441	-2512.3	238.1	6637.6	-8.96	0.60	2.96
650.0	-243932	50666	2301722	-2530.2	239.3	6643.5	-8.96	0.59	2.95
652.0	-249011	51146	2315015	-2548.1	240.5	6649.4	-8.97	0.59	2.95
654.0	-254125	51628	2328320	-2566.0	241.7	6655.3	-8.97	0.60	2.95
656.0	-259275	52113	2341636	-2584.0	242.9	6661.2	-8.98	0.60	2.94
658.0	-264461	52600	2354965	-2601.9	244.1	6667.1	-8.98	0.60	2.94
660.0	-269683	53089	2368305	-2619.9	245.3	6673.0	-8.98	0.59	2.95
662.0	-274940	53581	2381657	-2637.9	246.5	6678.9	-8.98	0.59	2.96
664.0	-280234	54075	2395020	-2655.8	247.7	6684.8	-8.99	0.59	2.97
666.0	-285564	54572	2408396	-2673.9	248.8	6690.7	-9.03	0.59	2.96
668.0	-290930	55070	2421783	-2692.0	250.0	6696.6	-9.06	0.59	2.95
670.0	-296332	55572	2435182	-2710.1	251.2	6702.5	-9.07	0.59	2.94

TABLE B-I. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S	DDXE M/S SQ	DDYE M/S SQ	DDZE M/S SQ
672.0	-301770	56075	2448593	-2728.2	252.4	6708.4	-9.05	0.59	2.94
674.0	-307244	56581	2462016	-2746.3	253.5	6714.3	-9.02	0.60	2.95
676.0	-312755	57089	2475450	-2764.3	254.7	6720.2	-9.01	0.60	2.95
678.0	-318302	57600	2488897	-2782.3	255.9	6726.1	-9.02	0.59	2.95
680.0	-323884	58113	2502355	-2800.4	257.1	6732.0	-9.03	0.59	2.94
682.0	-329503	58628	2515825	-2818.4	258.3	6737.9	-9.02	0.60	2.95
684.0	-335158	59146	2529306	-2836.4	259.5	6743.8	-9.00	0.59	2.95
686.0	-340849	59666	2542800	-2854.4	260.7	6749.7	-8.98	0.59	2.95
688.0	-346576	60189	2556305	-2872.4	261.9	6755.6	-8.97	0.61	2.95
690.0	-352338	60714	2569822	-2890.3	263.0	6761.5	-8.95	0.61	2.95
692.0	-358137	61241	2583351	-2908.2	264.2	6767.4	-8.94	0.56	2.95
694.0	-363971	61771	2596892	-2926.1	265.5	6773.3	-8.92	0.59	2.95
S-IVB 1ST GUIDANCE CUTOFF									
694.670	-365934	61949	2601431	-2932.1	265.8	6775.3	-8.92	0.53	2.95
696.0	-369841	62303	2610442	-2942.6	266.5	6772.6	-7.65	0.45	-3.36
698.0	-375742	62837	2623980	-2957.9	267.4	6765.9	-7.64	0.45	-3.37
700.0	-381673	63372	2637505	-2973.3	268.3	6759.1	-7.64	0.45	-3.34
702.0	-387635	63910	2651016	-2988.5	269.2	6752.4	-7.63	0.45	-3.40
704.0	-393627	64449	2664514	-3003.8	270.1	6745.6	-7.62	0.45	-3.41
PARKING ORBIT INSERTION									
704.670	-395641	64630	2669033	-3008.9	270.4	6743.3	-7.62	0.45	-3.42

TABLE B-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE

TIME SEC	XS KM	YS KM	ZS KM	DXS M/S	DYS M/S	DZS M/S	DDXS M/S SQ	DDYS M/S SQ	DDZS M/S SQ
GUIDANCE REFERENCE RELEASE									
-16.939	6373.382	17.692	-3.092	0.0	70.3	402.5	-0.02	-0.01	0.00
-16.0	6373.382	17.758	-2.714	-0.0	70.3	402.5	-0.02	-0.01	0.00
-15.0	6373.382	17.828	-2.311	-0.1	70.3	402.5	-0.02	-0.01	0.00
-14.0	6373.382	17.899	-1.908	-0.1	70.3	402.5	-0.02	-0.01	0.00
-13.0	6373.382	17.969	-1.506	-0.1	70.3	402.6	-0.02	-0.01	0.00
-12.0	6373.381	18.039	-1.103	-0.1	70.3	402.6	-0.02	-0.01	0.00
-11.0	6373.381	18.109	-0.701	-0.2	70.3	402.6	-0.02	-0.01	0.00
-10.0	6373.381	18.180	-0.298	-0.2	70.2	402.6	-0.02	-0.01	0.00
-9.0	6373.381	18.250	0.104	-0.2	70.2	402.6	-0.02	-0.01	0.00
-8.0	6373.381	18.320	0.507	-0.2	70.2	402.6	-0.02	-0.01	0.00
-7.0	6373.380	18.390	0.909	-0.3	70.2	402.6	-0.02	-0.01	0.00
-6.0	6373.380	18.461	1.312	-0.3	70.2	402.6	-0.02	-0.01	0.00
-5.0	6373.380	18.531	1.715	-0.3	70.2	402.6	-0.02	-0.01	0.00
-4.0	6373.380	18.601	2.117	-0.3	70.2	402.6	-0.02	-0.01	0.00
-3.0	6373.379	18.671	2.520	-0.4	70.1	402.6	-0.02	-0.01	0.00
-2.0	6373.379	18.741	2.922	-0.4	70.1	402.6	-0.02	-0.01	0.00
-1.0	6373.378	18.811	3.325	-0.4	70.1	402.6	-0.02	-0.01	0.00
0.0	6373.378	18.881	3.727	-0.4	70.1	402.6	-0.02	-0.01	0.00
ALL HOLDOWN ARMS RELEASED									
0.300	6373.378	18.902	3.848	-0.3	70.1	402.6	0.80	-0.01	-0.00
LIFTOFF - START OF TIME BASE 1									
0.600	6373.378	18.924	3.969	0.0	70.1	402.6	1.10	-0.01	0.00
1.0	6373.378	18.952	4.130	0.7	70.1	402.6	2.22	0.01	-0.03
2.0	6373.380	19.022	4.533	3.0	70.1	402.5	2.31	0.05	-0.02
3.0	6373.384	19.092	4.935	5.3	70.2	402.5	2.37	0.06	-0.03
4.0	6373.390	19.162	5.338	7.7	70.2	402.5	2.42	0.10	-0.02
5.0	6373.399	19.232	5.740	10.2	70.4	402.5	2.49	0.11	-0.03
6.0	6373.411	19.303	6.143	12.7	70.5	402.4	2.54	0.13	-0.03
7.0	6373.425	19.373	6.545	15.2	70.6	402.4	2.60	0.26	-0.06
8.0	6373.441	19.444	6.947	17.9	70.9	402.3	2.67	0.30	-0.06
9.0	6373.460	19.515	7.350	20.6	71.2	402.3	2.77	0.26	-0.04
10.0	6373.482	19.586	7.752	23.4	71.4	402.3	2.84	0.15	-0.01
11.0	6373.507	19.658	8.154	26.3	71.5	402.3	2.93	0.06	0.02
12.0	6373.535	19.729	8.557	29.2	71.5	402.3	2.98	0.05	0.05
13.0	6373.566	19.801	8.959	32.2	71.6	402.4	2.99	0.08	0.08
14.0	6373.599	19.873	9.361	35.2	71.7	402.5	3.04	0.09	0.10

TABLE B-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XS KM	YS KM	ZS KM	DXS M/S	DYS M/S	DZS M/S	DDXS M/S SQ	DDYS M/S SQ	DDZS M/S SQ
15.0	6373.636	19.944	9.764	38.3	71.7	402.6	3.11	0.05	0.11
16.0	6373.676	20.016	10.166	41.4	71.8	402.7	3.19	-0.03	0.13
17.0	6373.719	20.088	10.569	44.6	71.7	402.8	3.25	-0.10	0.15
18.0	6373.765	20.159	10.972	47.9	71.6	403.0	3.31	-0.10	0.19
19.0	6373.815	20.231	11.375	51.3	71.5	403.2	3.39	-0.08	0.23
20.0	6373.868	20.302	11.779	54.7	71.4	403.5	3.46	-0.06	0.24
21.0	6373.924	20.374	12.182	58.2	71.3	403.7	3.53	-0.04	0.28
22.0	6373.984	20.445	12.586	61.7	71.3	404.0	3.61	-0.04	0.32
23.0	6374.048	20.516	12.990	65.4	71.2	404.4	3.68	-0.04	0.37
24.0	6374.115	20.588	13.395	69.1	71.2	404.8	3.76	-0.05	0.43
25.0	6374.186	20.659	13.800	72.9	71.1	405.2	3.83	-0.06	0.49
26.0	6374.261	20.730	14.205	76.8	71.1	405.8	3.91	-0.07	0.57
27.0	6374.339	20.801	14.611	80.7	71.0	406.4	3.98	-0.07	0.65
28.0	6374.422	20.872	15.018	84.7	70.9	407.1	4.06	-0.07	0.74
29.0	6374.509	20.943	15.426	88.8	70.9	407.9	4.14	-0.07	0.83
30.0	6374.600	21.014	15.834	93.0	70.8	408.7	4.22	-0.07	0.93
31.0	6374.695	21.084	16.243	97.2	70.7	409.7	4.31	-0.07	1.03
32.0	6374.794	21.155	16.653	101.6	70.7	410.8	4.39	-0.08	1.14
33.0	6374.898	21.226	17.065	106.0	70.6	412.0	4.47	-0.08	1.26
34.0	6375.006	21.296	17.477	110.5	70.5	413.3	4.55	-0.08	1.38
35.0	6375.119	21.367	17.891	115.1	70.4	414.8	4.63	-0.08	1.51
36.0	6375.237	21.437	18.307	119.8	70.3	416.3	4.72	-0.08	1.64
37.0	6375.359	21.507	18.724	124.5	70.2	418.0	4.80	-0.07	1.77
38.0	6375.486	21.578	19.143	129.4	70.2	419.9	4.88	-0.07	1.92
39.0	6375.617	21.648	19.564	134.3	70.1	421.9	4.96	-0.07	2.07
40.0	6375.754	21.718	19.987	139.3	70.0	424.0	5.04	-0.07	2.23
41.0	6375.896	21.788	20.412	144.3	69.9	426.4	5.12	-0.08	2.40
42.0	6376.043	21.858	20.840	149.5	69.9	428.8	5.20	-0.08	2.57
43.0	6376.195	21.928	21.270	154.7	69.8	431.5	5.28	-0.08	2.76
44.0	6376.352	21.997	21.703	160.0	69.7	434.4	5.35	-0.09	2.95
45.0	6376.515	22.067	22.138	165.4	69.6	437.4	5.43	-0.09	3.14
46.0	6376.683	22.136	22.577	170.9	69.5	440.6	5.50	-0.09	3.33
47.0	6376.857	22.206	23.020	176.4	69.4	444.1	5.56	-0.08	3.54
48.0	6377.036	22.275	23.466	182.0	69.3	447.7	5.63	-0.08	3.74
49.0	6377.221	22.345	23.915	187.7	69.3	451.6	5.70	-0.06	3.95
50.0	6377.411	22.414	24.369	193.4	69.2	455.6	5.77	-0.05	4.16
51.0	6377.608	22.483	24.827	199.2	69.2	459.9	5.84	-0.04	4.37
52.0	6377.810	22.552	25.289	205.1	69.1	464.4	5.91	-0.02	4.59
53.0	6378.018	22.621	25.755	211.0	69.1	469.1	5.98	-0.01	4.82
54.0	6378.232	22.690	26.227	217.0	69.1	474.0	6.03	-0.00	5.05
55.0	6378.452	22.759	26.703	223.0	69.1	479.2	6.09	-0.00	5.28
56.0	6378.678	22.828	27.185	229.2	69.1	484.6	6.14	-0.01	5.52
57.0	6378.910	22.898	27.673	235.3	69.1	490.2	6.20	-0.01	5.75

TABLE B-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XS KM	YS KM	ZS KM	DXS M/S	DYS M/S	DZS M/S	DDXS M/S SQ	DDYS M/S SQ	DDZS M/S SQ
58.0	6379.149	22.967	28.166	241.6	69.1	496.1	6.25	-0.02	5.99
59.0	6379.393	23.036	28.665	247.8	69.0	502.2	6.29	-0.04	6.23
60.0	6379.644	23.105	29.170	254.1	69.0	508.5	6.33	-0.06	6.47
61.0	6379.902	23.174	29.682	260.5	68.9	515.1	6.36	-0.08	6.71
62.0	6380.165	23.242	30.201	266.8	68.8	521.9	6.38	-0.08	6.93
63.0	6380.435	23.311	30.726	273.2	68.7	529.0	6.39	-0.08	7.16
64.0	6380.712	23.380	31.259	279.6	68.7	536.3	6.39	-0.07	7.38
MACH 1									
65.000	6380.994	23.449	31.799	286.0	68.6	543.7	6.40	-0.04	7.60
66.0	6381.283	23.517	32.346	292.4	68.6	551.5	6.41	-0.02	7.82
67.0	6381.579	23.586	32.902	298.8	68.5	559.4	6.42	-0.00	8.04
68.0	6381.881	23.654	33.465	305.2	68.5	567.6	6.45	0.01	8.28
69.0	6382.189	23.723	34.037	311.7	68.5	576.0	6.49	0.00	8.53
70.0	6382.504	23.791	34.617	318.2	68.5	584.6	6.53	-0.01	8.79
71.0	6382.826	23.860	35.206	324.7	68.5	593.6	6.60	-0.02	9.05
72.0	6383.154	23.928	35.804	331.4	68.5	602.7	6.67	-0.03	9.31
73.0	6383.489	23.997	36.412	338.1	68.5	612.2	6.75	-0.04	9.55
74.0	6383.830	24.065	37.029	344.9	68.4	621.8	6.82	-0.05	9.80
75.0	6384.178	24.134	37.655	351.7	68.4	631.8	6.90	-0.03	10.04
76.0	6384.534	24.202	38.292	358.6	68.4	641.9	6.96	-0.01	10.28
77.0	6384.896	24.270	38.939	365.6	68.4	652.3	7.02	0.02	10.53
78.0	6385.265	24.339	39.597	372.7	68.4	663.0	7.06	0.07	10.79
79.0	6385.641	24.407	40.265	379.7	68.5	673.9	7.10	0.12	11.08
80.0	6386.024	24.476	40.945	386.8	68.7	685.2	7.13	0.17	11.40
81.0	6386.415	24.545	41.636	394.0	68.8	696.7	7.15	0.20	11.74
MAXIMUM DYNAMIC PRESSURE									
82.000	6386.812	24.613	42.339	401.1	69.0	708.7	7.16	0.20	12.11
83.0	6387.217	24.683	43.053	408.3	69.2	721.0	7.15	0.18	12.50
84.0	6387.629	24.752	43.781	415.4	69.4	733.7	7.13	0.14	12.91
85.0	6388.048	24.821	44.521	422.5	69.5	746.8	7.10	0.09	13.33
86.0	6388.474	24.891	45.274	429.6	69.5	760.3	7.06	0.05	13.73
87.0	6388.907	24.960	46.042	436.6	69.6	774.2	7.03	0.01	14.11
88.0	6389.347	25.030	46.823	443.7	69.6	788.5	7.01	-0.02	14.48
89.0	6389.794	25.100	47.619	450.7	69.5	803.2	7.01	-0.03	14.82
90.0	6390.248	25.169	48.429	457.7	69.5	818.2	7.03	-0.03	15.15
91.0	6390.710	25.239	49.255	464.7	69.5	833.5	7.07	-0.04	15.47
92.0	6391.178	25.308	50.097	471.8	69.4	849.1	7.10	-0.04	15.77
93.0	6391.653	25.377	50.954	478.9	69.4	865.0	7.14	-0.04	16.08
94.0	6392.136	25.447	51.827	486.1	69.3	881.3	7.19	-0.06	16.38

TABLE B-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XS KM	YS KM	ZS KM	DXS M/S	DYS M/S	DZS M/S	DDXS M/S SQ	DDYS M/S SQ	DDZS M/S SQ
95.0	6392.626	25.516	52.716	493.3	69.3	897.8	7.22	-0.09	16.68
96.0	6393.122	25.585	53.622	500.5	69.1	914.6	7.24	-0.11	16.99
97.0	6393.627	25.654	54.546	507.8	69.0	931.8	7.26	-0.14	17.32
98.0	6394.138	25.723	55.486	515.0	68.9	949.3	7.27	-0.17	17.65
99.0	6394.657	25.792	56.444	522.3	68.7	967.1	7.28	-0.19	17.99
100.0	6395.183	25.861	57.421	529.6	68.5	985.3	7.28	-0.19	18.34
101.0	6395.716	25.929	58.415	536.8	68.3	1003.8	7.29	-0.17	18.69
102.0	6396.256	25.997	59.428	544.1	68.2	1022.7	7.29	-0.14	19.03
103.0	6396.804	26.065	60.460	551.4	68.1	1041.8	7.30	-0.10	19.37
104.0	6397.359	26.133	61.512	558.7	68.0	1061.4	7.32	-0.06	19.69
105.0	6397.922	26.201	62.583	566.0	67.9	1081.2	7.33	-0.04	20.02
106.0	6398.491	26.269	63.675	573.4	67.9	1101.4	7.35	-0.02	20.33
107.0	6399.068	26.337	64.786	580.7	67.9	1121.9	7.38	-0.01	20.65
108.0	6399.653	26.405	65.919	588.1	67.8	1142.7	7.42	-0.02	20.97
109.0	6400.245	26.473	67.072	595.6	67.8	1163.8	7.47	-0.04	21.29
110.0	6400.844	26.541	68.246	603.1	67.7	1185.3	7.54	-0.06	21.61
111.0	6401.451	26.608	69.442	610.7	67.7	1207.1	7.61	-0.08	21.92
112.0	6402.065	26.676	70.661	618.3	67.6	1229.1	7.67	-0.09	22.24
113.0	6402.687	26.743	71.901	626.0	67.5	1251.5	7.73	-0.09	22.57
114.0	6403.317	26.811	73.164	633.7	67.4	1274.3	7.77	-0.08	22.90
115.0	6403.955	26.878	74.450	641.5	67.3	1297.4	7.79	-0.07	23.26
116.0	6404.600	26.946	75.759	649.3	67.3	1320.8	7.79	-0.06	23.63
117.0	6405.253	27.013	77.091	657.1	67.2	1344.6	7.78	-0.06	24.02
118.0	6405.914	27.080	78.448	664.8	67.1	1368.9	7.76	-0.07	24.42
119.0	6406.583	27.147	79.829	672.6	67.0	1393.5	7.74	-0.08	24.84
120.0	6407.259	27.214	81.235	680.3	67.0	1418.6	7.72	-0.11	25.27
121.0	6407.944	27.281	82.666	688.0	66.9	1444.0	7.71	-0.13	25.68
122.0	6408.635	27.348	84.123	695.7	66.7	1470.0	7.71	-0.15	26.11
123.0	6409.335	27.415	85.606	703.4	66.6	1496.3	7.72	-0.16	26.54
124.0	6410.042	27.481	87.116	711.1	66.4	1523.1	7.74	-0.17	26.97
125.0	6410.757	27.547	88.653	718.9	66.2	1550.3	7.77	-0.17	27.40
126.0	6411.480	27.613	90.217	726.7	66.1	1577.9	7.81	-0.16	27.83
127.0	6412.211	27.679	91.809	734.5	65.9	1606.0	7.86	-0.16	28.27
128.0	6412.949	27.745	93.429	742.4	65.7	1634.5	7.91	-0.18	28.70
129.0	6413.696	27.811	95.078	750.3	65.6	1663.4	7.97	-0.13	29.15
130.0	6414.450	27.876	96.756	758.3	65.4	1692.8	8.03	-0.14	29.61
131.0	6415.212	27.942	98.464	766.3	65.3	1722.7	8.08	-0.16	30.06
132.0	6415.983	28.007	100.202	774.5	65.1	1752.9	8.14	-0.14	30.51
133.0	6416.761	28.072	101.970	782.6	65.0	1783.7	8.20	-0.18	31.00
134.0	6417.548	28.137	103.769	790.9	64.8	1814.9	8.27	-0.19	31.48
135.0	6418.343	28.201	105.600	799.2	64.6	1846.7	8.34	-0.17	31.96
135.960	S-IC CENTER ENGINE CUTOFF (ENGINE SOLENOID)								
	6419.114	28.263	107.388	807.2	64.4	1877.6	8.40	-0.16	32.43

TABLE B-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XS KM	YS KM	ZS KM	DXS M/S	DYS M/S	DZS M/S	DDXS M/S SQ	DDYS M/S SQ	DDZS M/S SQ
136.0	6419.146	28.266	107.463	807.5	64.4	1878.9	8.41	-0.16	32.45
137.0	6419.957	28.330	109.356	813.4	64.3	1907.1	4.88	-0.17	26.35
138.0	6420.772	28.394	111.275	818.3	64.1	1933.4	4.90	-0.18	26.31
139.0	6421.593	28.458	113.222	823.2	63.9	1959.8	4.94	-0.13	26.52
140.0	6422.418	28.522	115.195	828.2	63.8	1986.5	4.99	-0.13	26.84
141.0	6423.248	28.586	117.195	833.2	63.7	2013.5	5.04	-0.12	27.20
142.0	6424.083	28.650	119.222	838.2	63.5	2040.9	5.09	-0.13	27.59
143.0	6424.924	28.713	121.277	843.3	63.4	2068.7	5.14	-0.14	27.99
144.0	6425.770	28.776	123.360	848.5	63.2	2097.0	5.19	-0.15	28.41
145.0	6426.621	28.840	125.471	853.7	63.1	2125.6	5.25	-0.16	28.82
146.0	6427.477	28.903	127.611	859.0	62.9	2154.6	5.30	-0.16	29.24
147.0	6428.338	28.965	129.780	864.2	62.8	2184.1	5.35	-0.16	29.67
148.0	6429.205	29.028	131.979	869.5	62.6	2214.0	5.39	-0.16	30.09
149.0	6430.077	29.091	134.208	874.9	62.4	2244.3	5.44	-0.16	30.51
150.0	6430.955	29.153	136.468	880.4	62.3	2275.0	5.49	-0.16	30.94
151.0	6431.838	29.215	138.758	885.9	62.1	2306.1	5.54	-0.16	31.36
152.0	6432.727	29.277	141.080	891.5	61.9	2337.8	5.61	-0.16	31.84
153.0	6433.621	29.339	143.434	897.1	61.8	2369.8	5.62	-0.17	32.31
154.0	6434.521	29.401	145.820	902.8	61.6	2402.4	5.69	-0.18	32.79
155.0	6435.427	29.462	148.239	908.5	61.4	2435.4	5.76	-0.13	33.26
156.0	6436.338	29.524	150.691	914.3	61.3	2468.9	5.83	-0.19	33.74
157.0	6437.256	29.585	153.177	920.2	61.1	2502.9	5.90	-0.18	34.21
158.0	6438.179	29.646	155.697	926.1	60.9	2537.4	5.97	-0.15	34.69
159.0	6439.108	29.707	158.251	932.1	60.8	2572.3	6.04	-0.18	35.16
S-IC OUTBOARD ENGINE CUTOFF (ENGINE SOLENOID)									
159.560	6439.630	29.741	159.696	935.5	60.7	2592.1	6.08	-0.17	35.43
160.0	6440.042	29.767	160.838	935.3	60.6	2600.8	-6.85	-0.02	4.29
161.0	6440.973	29.828	163.439	926.6	60.6	2602.2	-9.77	-0.03	-0.37
S-IC/S-II SEPARATION COMMAND									
161.200	6441.158	29.840	163.960	924.6	60.6	2602.1	-9.75	-0.03	-0.36
162.0	6441.894	29.889	166.040	916.9	60.6	2601.8	-9.69	-0.03	-0.34
164.0	6443.709	30.010	171.244	898.1	60.5	2601.9	-8.94	-0.04	1.94
166.0	6445.490	30.130	176.456	882.7	60.4	2610.4	-7.19	-0.04	4.98
168.0	6447.241	30.251	181.686	868.7	60.3	2620.9	-6.54	-0.03	6.22
170.0	6448.965	30.372	186.940	855.7	60.3	2634.1	-6.45	-0.03	6.70
172.0	6450.664	30.492	192.222	842.7	60.2	2647.1	-6.36	-0.02	6.83
174.0	6452.337	30.613	197.530	830.1	60.2	2660.9	-6.33	-0.01	6.86
176.0	6453.984	30.733	202.865	817.4	60.1	2674.6	-6.32	-0.01	6.88
178.0	6455.606	30.853	208.228	804.8	60.1	2688.4	-6.29	-0.02	6.91

TABLE B-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XS KM	YS KM	ZS KM	DXS M/S	DYS M/S	DZS M/S	DDXS M/S SQ	DDYS M/S SQ	DDZS M/S SQ
180.0	6457.203	30.973	213.619	792.2	60.1	2702.3	-6.27	-0.01	6.94
182.0	6458.775	31.093	219.038	779.7	60.0	2716.2	-6.25	-0.02	6.96
184.0	6460.322	31.214	224.484	767.2	60.0	2730.1	-6.23	-0.02	6.99
186.0	6461.844	31.333	229.958	754.8	60.0	2744.2	-6.21	-0.02	7.02
188.0	6463.341	31.453	235.461	742.4	59.9	2758.2	-6.19	-0.02	7.05
190.0	6464.814	31.573	240.991	730.0	59.9	2772.3	-6.17	-0.02	7.08
192.0	6466.261	31.693	246.550	717.7	59.9	2786.5	-6.14	-0.02	7.11
194.0	6467.684	31.813	252.137	705.4	59.8	2800.8	-6.11	-0.01	7.14
196.0	6469.083	31.932	257.753	693.2	59.8	2815.1	-6.09	-0.01	7.19
198.0	6470.457	32.052	263.398	681.0	59.8	2829.5	-6.06	-0.01	7.23
200.0	6471.807	32.171	269.071	669.0	59.7	2844.0	-6.03	-0.02	7.25
202.0	6473.133	32.291	274.774	656.9	59.7	2858.5	-6.03	-0.01	7.28
204.0	6474.435	32.410	280.506	644.8	59.7	2873.2	-6.09	-0.01	7.34
206.0	6475.712	32.529	286.267	632.5	59.6	2887.9	-6.22	-0.00	7.42
208.0	6476.964	32.649	292.057	619.8	59.6	2902.9	-6.38	0.01	7.52
210.0	6478.191	32.768	297.878	606.9	59.7	2918.0	-6.52	0.02	7.61
212.0	6479.392	32.887	303.730	593.8	59.7	2933.3	-6.59	0.02	7.67
214.0	6480.566	33.007	309.612	580.6	59.7	2948.7	-6.60	0.01	7.71
216.0	6481.714	33.126	315.524	567.4	59.7	2964.1	-6.58	0.01	7.74
218.0	6482.836	33.246	321.468	554.2	59.8	2979.6	-6.58	0.02	7.76
220.0	6483.931	33.365	327.443	541.1	59.8	2995.2	-6.59	0.02	7.79
222.0	6485.000	33.485	333.449	527.9	59.8	3010.8	-6.58	0.02	7.82
224.0	6486.043	33.604	339.486	514.7	59.9	3026.5	-6.58	0.02	7.86
226.0	6487.059	33.724	345.555	501.5	59.9	3042.3	-6.58	0.02	7.89
228.0	6488.049	33.844	351.655	488.4	59.9	3058.1	-6.58	0.02	7.92
230.0	6489.013	33.964	357.787	475.2	60.0	3074.0	-6.59	0.02	7.96
232.0	6489.950	34.084	363.951	462.0	60.0	3089.9	-6.58	0.02	8.00
234.0	6490.861	34.204	370.147	448.8	60.0	3105.9	-6.58	0.01	8.03
236.0	6491.745	34.324	376.375	435.7	60.0	3122.0	-6.58	-0.00	8.07
238.0	6492.603	34.444	382.635	422.5	60.0	3138.2	-6.58	-0.00	8.11
240.0	6493.435	34.564	388.928	409.3	60.0	3154.5	-6.59	0.00	8.14
242.0	6494.240	34.684	395.253	396.1	60.0	3170.8	-6.60	0.00	8.17
244.0	6495.019	34.804	401.611	382.9	60.0	3187.2	-6.60	-0.00	8.21
246.0	6495.772	34.924	408.002	369.7	60.0	3203.6	-6.60	-0.01	8.25
248.0	6496.498	35.044	414.426	356.5	60.0	3220.2	-6.61	-0.01	8.29
250.0	6497.198	35.164	420.883	343.2	60.0	3236.8	-6.61	-0.01	8.32
252.0	6497.871	35.284	427.373	330.0	59.9	3253.5	-6.61	-0.01	8.36
254.0	6498.518	35.404	433.897	316.8	59.9	3270.2	-6.61	-0.01	8.39
256.0	6499.138	35.524	440.454	303.6	59.9	3287.1	-6.61	-0.01	8.43
258.0	6499.732	35.643	447.045	290.3	59.9	3304.0	-6.62	-0.01	8.46
260.0	6500.300	35.763	453.670	277.1	59.9	3320.9	-6.62	-0.01	8.50
262.0	6500.840	35.883	460.329	263.8	59.8	3338.0	-6.62	-0.01	8.54
264.0	6501.355	36.002	467.022	250.5	59.8	3355.1	-6.62	-0.01	8.59



TABLE B-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XS KM	YS KM	ZS KM	DXS M/S	DYS M/S	DZS M/S	DDXS M/S SQ	DDYS M/S SQ	DDZS M/S SQ
266.0	6501.843	36.122	473.749	237.3	59.8	3372.3	-6.63	-0.01	8.63
268.0	6502.304	36.242	480.511	224.0	59.8	3389.6	-6.63	-0.01	8.66
270.0	6502.739	36.361	487.308	210.7	59.7	3407.0	-6.64	-0.01	8.70
272.0	6503.147	36.481	494.139	197.4	59.7	3424.4	-6.64	-0.01	8.74
274.0	6503.528	36.600	501.006	184.1	59.7	3441.9	-6.65	-0.01	8.78
276.0	6503.883	36.719	507.907	170.8	59.7	3459.5	-6.66	-0.02	8.82
278.0	6504.211	36.839	514.844	157.5	59.6	3477.2	-6.67	-0.02	8.87
280.0	6504.513	36.958	521.816	144.1	59.6	3495.0	-6.67	-0.01	8.91
282.0	6504.788	37.077	528.824	130.8	59.6	3512.9	-6.67	-0.01	8.95
284.0	6505.036	37.196	535.868	117.4	59.5	3530.8	-6.67	-0.02	8.99
286.0	6505.258	37.315	542.948	104.0	59.5	3548.9	-6.68	-0.02	9.03
288.0	6505.452	37.434	550.063	90.7	59.4	3567.0	-6.69	-0.01	9.08
290.0	6505.620	37.553	557.216	77.2	59.4	3585.2	-6.70	-0.01	9.13
292.0	6505.761	37.672	564.404	63.8	59.4	3603.5	-6.71	-0.02	9.17
294.0	6505.875	37.790	571.630	50.4	59.3	3621.9	-6.72	-0.02	9.22
296.0	6505.963	37.909	578.892	36.9	59.3	3640.4	-6.73	-0.01	9.27
298.0	6506.023	38.027	586.191	23.4	59.2	3659.0	-6.73	-0.02	9.31
300.0	6506.056	38.146	593.528	10.0	59.2	3677.6	-6.73	-0.02	9.36
302.0	6506.063	38.264	600.902	-3.5	59.2	3696.4	-6.75	-0.02	9.40
304.0	6506.042	38.382	608.314	-17.0	59.1	3715.3	-6.76	-0.02	9.45
306.0	6505.995	38.501	615.763	-30.6	59.1	3734.2	-6.77	-0.02	9.50
308.0	6505.920	38.619	623.251	-44.1	59.0	3753.3	-6.77	-0.02	9.55
310.0	6505.818	38.737	630.776	-57.7	59.0	3772.4	-6.78	-0.01	9.60
312.0	6505.689	38.854	638.340	-71.3	58.9	3791.7	-6.79	-0.02	9.65
314.0	6505.533	38.972	645.943	-84.9	58.9	3811.0	-6.80	-0.02	9.70
316.0	6505.350	39.090	653.585	-98.5	58.8	3830.5	-6.81	-0.02	9.75
318.0	6505.139	39.208	661.265	-112.2	58.8	3850.0	-6.83	-0.02	9.80
320.0	6504.901	39.325	668.985	-125.9	58.8	3869.7	-6.84	-0.02	9.86
322.0	6504.635	39.443	676.744	-139.6	58.7	3889.5	-6.85	-0.02	9.91
324.0	6504.342	39.560	684.543	-153.3	58.7	3909.3	-6.86	-0.02	9.96
326.0	6504.022	39.677	692.381	-167.1	58.6	3929.3	-6.87	-0.02	10.01
328.0	6503.674	39.795	700.260	-180.8	58.6	3949.4	-6.89	-0.02	10.07
330.0	6503.299	39.912	708.179	-194.6	58.5	3969.6	-6.90	-0.02	10.13
332.0	6502.896	40.029	716.138	-208.4	58.5	3989.9	-6.90	-0.02	10.18
334.0	6502.465	40.146	724.139	-222.3	58.4	4010.3	-6.92	-0.02	10.23
336.0	6502.007	40.262	732.180	-236.1	58.4	4030.8	-6.94	-0.02	10.29
338.0	6501.520	40.379	740.262	-250.0	58.3	4051.5	-6.95	-0.02	10.36
340.0	6501.006	40.496	748.386	-264.0	58.3	4072.3	-6.97	-0.02	10.41
342.0	6500.464	40.612	756.551	-277.9	58.2	4093.1	-6.98	-0.02	10.47
344.0	6499.895	40.729	764.758	-291.9	58.2	4114.1	-6.99	-0.02	10.52
346.0	6499.297	40.845	773.008	-306.0	58.1	4135.2	-7.01	-0.02	10.59
348.0	6498.671	40.961	781.299	-320.0	58.1	4156.5	-7.03	-0.02	10.65
350.0	6498.017	41.077	789.634	-334.1	58.0	4177.9	-7.05	-0.01	10.71

TABLE B-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XS KM	YS KM	ZS KM	DXS M/S	DYS M/S	DZS M/S	DDXS M/S SQ	DDYS M/S SQ	DDZS M/S SQ
352.0	6497.334	41.193	798.011	-348.2	58.0	4199.4	-7.06	-0.01	10.77
354.0	6496.624	41.309	806.431	-362.4	58.0	4221.0	-7.07	-0.01	10.83
356.0	6495.885	41.425	814.895	-376.5	57.9	4242.7	-7.08	-0.02	10.90
358.0	6495.117	41.541	823.402	-390.7	57.9	4264.6	-7.09	-0.01	10.97
360.0	6494.322	41.657	831.953	-405.0	57.9	4286.6	-7.11	-0.01	11.03
362.0	6493.498	41.772	840.549	-419.2	57.8	4308.7	-7.14	-0.01	11.10
364.0	6492.645	41.888	849.188	-433.5	57.8	4331.0	-7.17	-0.01	11.16
366.0	6491.763	42.004	857.873	-447.9	57.8	4353.4	-7.19	-0.01	11.23
368.0	6490.853	42.119	866.602	-462.3	57.8	4375.9	-7.20	-0.02	11.30
370.0	6489.914	42.235	875.376	-476.7	57.7	4398.6	-7.22	-0.03	11.37
372.0	6488.946	42.350	884.196	-491.2	57.6	4421.4	-7.24	-0.02	11.44
374.0	6487.949	42.465	893.062	-505.7	57.6	4444.4	-7.26	-0.02	11.51
376.0	6486.923	42.580	901.974	-520.3	57.5	4467.5	-7.29	-0.01	11.59
378.0	6485.868	42.695	910.932	-534.9	57.5	4490.7	-7.31	-0.02	11.66
380.0	6484.784	42.810	919.937	-549.6	57.5	4514.1	-7.33	-0.02	11.73
382.0	6483.670	42.925	928.988	-564.3	57.4	4537.6	-7.35	-0.02	11.81
384.0	6482.526	43.040	938.087	-579.0	57.4	4561.3	-7.38	-0.02	11.88
386.0	6481.354	43.155	947.234	-593.8	57.3	4585.2	-7.40	-0.02	11.96
388.0	6480.151	43.270	956.428	-608.7	57.3	4609.2	-7.42	-0.02	12.04
390.0	6478.919	43.384	965.671	-623.6	57.2	4633.4	-7.45	-0.03	12.12
392.0	6477.657	43.499	974.962	-638.5	57.2	4657.7	-7.47	-0.03	12.20
394.0	6476.365	43.613	984.302	-653.5	57.1	4682.2	-7.49	-0.02	12.28
396.0	6475.043	43.727	993.691	-668.5	57.1	4706.8	-7.52	-0.02	12.37
398.0	6473.691	43.841	1003.129	-683.6	57.0	4731.6	-7.56	-0.03	12.45
400.0	6472.309	43.955	1012.617	-698.7	56.9	4756.6	-7.59	-0.04	12.53
402.0	6470.896	44.069	1022.156	-714.0	56.9	4781.8	-7.61	-0.04	12.62
404.0	6469.453	44.183	1031.744	-729.2	56.8	4807.1	-7.63	-0.04	12.70
406.0	6467.979	44.296	1041.384	-744.5	56.7	4832.6	-7.66	-0.04	12.78
408.0	6466.475	44.409	1051.075	-759.9	56.6	4858.3	-7.69	-0.04	12.88
410.0	6464.939	44.522	1060.817	-775.3	56.5	4884.1	-7.72	-0.04	12.97
412.0	6463.373	44.635	1070.611	-790.8	56.4	4910.1	-7.76	-0.04	13.07
414.0	6461.776	44.748	1080.458	-806.4	56.4	4936.4	-7.79	-0.04	13.16
416.0	6460.148	44.861	1090.357	-822.0	56.3	4962.8	-7.81	-0.03	13.25
418.0	6458.488	44.973	1100.309	-837.6	56.2	4989.4	-7.83	-0.03	13.34
420.0	6456.797	45.086	1110.315	-853.4	56.2	5016.2	-7.86	-0.03	13.44
422.0	6455.075	45.198	1120.374	-869.1	56.1	5043.2	-7.90	-0.04	13.54
424.0	6453.321	45.310	1130.487	-885.0	56.0	5070.3	-7.94	-0.04	13.64
426.0	6451.535	45.422	1140.655	-900.9	55.9	5097.7	-7.98	-0.04	13.74
428.0	6449.717	45.534	1150.878	-916.9	55.8	5125.3	-8.01	-0.04	13.85
430.0	6447.867	45.645	1161.157	-933.0	55.7	5153.1	-8.04	-0.04	13.95
432.0	6445.985	45.757	1171.491	-949.1	55.6	5181.1	-8.07	-0.04	14.05
434.0	6444.070	45.868	1181.881	-965.3	55.5	5209.3	-8.11	-0.04	14.15
436.0	6442.123	45.979	1192.329	-981.6	55.5	5237.8	-8.15	-0.03	14.26

TABLE B-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XS KM	YS KM	ZS KM	DXS M/S	DYS M/S	DZS M/S	DDXS M/S SQ	DDYS M/S SQ	DDZS M/S SQ
438.0	6440.144	46.090	1202.833	-998.0	55.4	5266.4	-8.19	-0.04	14.38
440.0	6438.132	46.200	1213.394	-1014.4	55.3	5295.3	-8.23	-0.04	14.49
442.0	6436.086	46.311	1224.014	-1030.9	55.2	5324.4	-8.27	-0.04	14.61
444.0	6434.008	46.421	1234.692	-1047.5	55.1	5353.7	-8.30	-0.04	14.73
446.0	6431.896	46.531	1245.429	-1064.2	55.0	5383.3	-8.34	-0.04	14.84
448.0	6429.751	46.641	1256.225	-1080.9	55.0	5413.1	-8.38	-0.04	14.96
450.0	6427.573	46.751	1267.082	-1097.7	54.9	5443.2	-8.42	-0.04	15.08
452.0	6425.360	46.861	1277.998	-1114.6	54.8	5473.4	-8.46	-0.04	15.20
454.0	6423.114	46.970	1288.976	-1131.6	54.7	5504.0	-8.51	-0.04	15.33
456.0	6420.834	47.079	1300.014	-1148.6	54.6	5534.7	-8.55	-0.03	15.45
458.0	6418.520	47.189	1311.115	-1165.8	54.5	5565.7	-8.59	-0.05	15.57
459.560	6416.691	47.274	1319.816	-1179.2	54.4	5590.1	-8.62	-0.07	15.67
460.0	6416.171	47.297	1322.277	-1183.1	54.4	5596.3	-8.65	-0.04	12.48
462.0	6413.788	47.406	1335.494	-1200.5	54.2	5620.9	-8.78	-0.09	12.30
464.0	6411.369	47.514	1344.761	-1218.1	54.0	5645.6	-8.80	-0.11	12.35
466.0	6408.915	47.622	1356.077	-1235.7	53.8	5670.3	-8.77	-0.08	12.41
468.0	6406.426	47.730	1367.442	-1253.2	53.7	5695.2	-8.67	-0.08	12.48
470.0	6403.902	47.837	1378.858	-1270.3	53.5	5720.2	-8.40	-0.08	12.55
472.0	6401.345	47.944	1390.324	-1286.7	53.3	5745.4	-7.98	-0.07	12.64
474.0	6398.756	48.050	1401.841	-1302.3	53.1	5771.0	-7.65	-0.11	12.72
476.0	6396.136	48.156	1413.408	-1317.5	52.9	5796.5	-7.55	-0.08	12.80
478.0	6393.486	48.262	1425.027	-1332.7	52.8	5822.2	-7.61	-0.07	12.88
480.0	6390.805	48.367	1436.697	-1348.0	52.6	5848.0	-7.68	-0.11	12.95
482.0	6388.093	48.472	1448.420	-1363.4	52.4	5874.0	-7.74	-0.05	13.02
484.0	6385.350	48.577	1460.194	-1379.0	52.3	5900.1	-7.78	-0.09	13.10
486.0	6382.576	48.682	1472.018	-1395.0	52.1	5923.3	-8.18	-0.08	11.31
488.0	6379.769	48.786	1483.888	-1411.6	52.0	5945.9	-8.30	-0.05	11.30
490.0	6376.929	48.890	1495.803	-1428.3	51.9	5968.6	-8.37	-0.05	11.35
492.0	6374.056	48.993	1507.763	-1445.1	51.8	5991.3	-8.43	-0.05	11.40
494.0	6371.149	49.097	1519.769	-1462.0	51.7	6014.4	-8.49	-0.05	11.46
496.0	6368.208	49.200	1531.821	-1479.1	51.5	6037.4	-8.59	-0.05	11.53
498.0	6365.232	49.303	1543.918	-1496.5	51.4	6060.5	-8.75	-0.05	11.59
500.0	6362.222	49.406	1556.063	-1514.2	51.3	6083.8	-8.94	-0.04	11.67
502.0	6359.175	49.508	1568.253	-1532.2	51.2	6107.2	-9.09	-0.04	11.75
504.0	6356.093	49.611	1580.491	-1550.5	51.2	6130.7	-9.16	-0.03	11.82
506.0	6352.973	49.713	1592.777	-1568.9	51.1	6154.4	-9.20	-0.03	11.88
508.0	6349.817	49.815	1605.109	-1587.4	51.0	6178.3	-9.26	-0.04	11.96
510.0	6346.624	49.917	1617.490	-1606.0	50.9	6202.3	-9.34	-0.04	12.05
512.0	6343.393	50.019	1629.919	-1624.7	50.8	6226.5	-9.39	-0.05	12.13
514.0	6340.125	50.120	1642.396	-1643.6	50.7	6250.8	-9.43	-0.05	12.20

S-II CENTER ENGINE CUTOFF (ENGINE SOLENOID)

TABLE B-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XS KM	YS KM	ZS KM	DXS M/S	DYS M/S	DZS M/S	DDXS M/S SQ	DDYS M/S SQ	DDZS M/S SQ
S-II OUTBOARD ENGINE CUTOFF (ENGINE SOLENOID)									
549.080	6276.515	51.870	1869.349	-1990.0	49.0	6705.8	-10.31	-0.20	13.96
550.0	6274.641	51.916	1875.649	-1999.1	49.0	6707.3	-8.83	0.06	-3.45
S-II/S-IVB SEPARATION COMMAND									
550.100	6274.441	51.921	1876.319	-2000.0	49.0	6706.9	-8.83	0.05	-3.45
552.0	6270.626	52.015	1889.053	-2016.8	49.0	6700.4	-8.83	-0.05	-3.45
554.0	6266.575	52.112	1902.446	-2034.5	48.9	6693.9	-8.93	-0.08	-1.80
556.0	6262.489	52.210	1915.834	-2052.8	48.6	6695.4	-9.28	-0.10	2.09
558.0	6258.365	52.307	1929.229	-2071.5	48.4	6700.0	-9.30	-0.08	2.37
560.0	6254.204	52.404	1942.633	-2090.1	48.3	6704.7	-9.37	-0.11	2.41
562.0	6250.005	52.500	1956.048	-2109.0	48.0	6709.5	-9.49	-0.12	2.46
564.0	6245.769	52.596	1969.471	-2127.8	47.8	6714.4	-9.54	-0.11	2.45
566.0	6241.494	52.691	1982.905	-2146.9	47.5	6719.3	-9.53	-0.10	2.47
568.0	6237.181	52.786	1996.349	-2166.0	47.3	6724.3	-9.51	-0.10	2.47
570.0	6232.830	52.880	2009.802	-2185.1	47.1	6729.2	-9.54	-0.09	2.47
572.0	6228.440	52.974	2023.266	-2204.2	46.9	6734.2	-9.59	-0.08	2.47
574.0	6224.013	53.068	2036.729	-2223.5	46.8	6739.1	-9.63	-0.07	2.46
576.0	6219.546	53.161	2050.222	-2242.8	46.6	6744.0	-9.66	-0.06	2.44
578.0	6215.041	53.255	2063.715	-2262.2	46.5	6748.9	-9.68	-0.05	2.43
580.0	6210.498	53.348	2077.217	-2281.6	46.4	6753.7	-9.69	-0.04	2.42
582.0	6205.915	53.440	2090.730	-2301.0	46.3	6758.6	-9.71	-0.04	2.41
584.0	6201.294	53.533	2104.252	-2320.4	46.2	6763.4	-9.72	-0.04	2.40

TABLE B-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XS KM	YS KM	ZS KM	DXS M/S	DYS M/S	DZS M/S	DDXS M/S SQ	DDYS M/S SQ	DDZS M/S SQ
586.0	6196.633	53.625	2117.783	-2339.9	46.2	6768.2	-9.73	-0.04	2.41
588.0	6191.934	53.718	2131.324	-2359.4	46.1	6773.0	-9.73	-0.03	2.41
590.0	6187.196	53.810	2144.875	-2378.9	46.0	6777.8	-9.73	-0.03	2.40
592.0	6182.419	53.902	2158.436	-2398.4	45.9	6782.7	-9.73	-0.03	2.40
594.0	6177.602	53.993	2172.006	-2417.9	45.9	6787.5	-9.74	-0.03	2.40
596.0	6172.747	54.085	2185.586	-2437.4	45.8	6792.3	-9.76	-0.02	2.39
598.0	6167.853	54.177	2199.175	-2457.0	45.7	6797.1	-9.78	-0.02	2.40
600.0	6162.919	54.268	2212.774	-2476.5	45.7	6801.8	-9.79	-0.02	2.39
602.0	6157.947	54.359	2226.382	-2496.2	45.6	6806.6	-9.80	-0.02	2.38
604.0	6152.935	54.451	2240.000	-2515.8	45.6	6811.4	-9.81	-0.02	2.36
606.0	6147.883	54.542	2253.628	-2535.5	45.5	6816.1	-9.82	-0.03	2.35
608.0	6142.793	54.633	2267.265	-2555.1	45.4	6820.8	-9.83	-0.03	2.34
610.0	6137.663	54.723	2280.911	-2574.8	45.4	6825.5	-9.83	-0.03	2.33
612.0	6132.493	54.814	2294.567	-2594.5	45.3	6830.1	-9.83	-0.03	2.32
614.0	6127.285	54.905	2308.231	-2614.2	45.2	6834.8	-9.84	-0.02	2.32
616.0	6122.037	54.995	2321.906	-2633.9	45.2	6839.4	-9.84	-0.02	2.34
618.0	6116.749	55.085	2335.589	-2653.6	45.1	6844.1	-9.83	-0.02	2.34
620.0	6111.422	55.176	2349.282	-2673.3	45.1	6848.8	-9.84	-0.03	2.33
622.0	6106.056	55.266	2362.984	-2693.0	45.0	6853.5	-9.85	-0.04	2.31
624.0	6100.650	55.356	2376.696	-2712.7	44.9	6858.1	-9.86	-0.05	2.29
626.0	6095.205	55.445	2390.417	-2732.5	44.8	6862.6	-9.88	-0.04	2.28
628.0	6089.720	55.535	2404.147	-2752.3	44.7	6867.2	-9.89	-0.04	2.28
630.0	6084.196	55.624	2417.886	-2772.1	44.6	6871.8	-9.90	-0.04	2.27
632.0	6078.632	55.713	2431.634	-2791.9	44.5	6876.3	-9.90	-0.05	2.27
634.0	6073.028	55.802	2445.391	-2811.8	44.4	6880.9	-9.89	-0.04	2.26
636.0	6067.385	55.890	2459.157	-2831.6	44.3	6885.4	-9.88	-0.04	2.26
638.0	6061.702	55.979	2472.932	-2851.3	44.2	6889.9	-9.87	-0.04	2.26
640.0	6055.980	56.067	2486.717	-2871.1	44.1	6894.4	-9.88	-0.05	2.24
642.0	6050.217	56.155	2500.510	-2890.9	43.9	6898.9	-9.89	-0.06	2.23
644.0	6044.416	56.243	2514.312	-2910.7	43.8	6903.4	-9.90	-0.06	2.23
646.0	6038.575	56.330	2528.123	-2930.6	43.7	6907.8	-9.92	-0.06	2.24
648.0	6032.694	56.418	2541.944	-2950.4	43.6	6912.3	-9.92	-0.06	2.23
650.0	6026.773	56.504	2555.773	-2970.3	43.4	6916.8	-9.92	-0.06	2.22
652.0	6020.812	56.591	2569.611	-2990.2	43.3	6921.2	-9.92	-0.06	2.22
654.0	6014.812	56.678	2583.458	-3010.0	43.1	6925.7	-9.92	-0.06	2.21
656.0	6008.772	56.764	2597.313	-3029.9	43.0	6930.1	-9.94	-0.06	2.20
658.0	6002.692	56.850	2611.178	-3049.8	42.9	6934.5	-9.94	-0.06	2.19
660.0	5996.573	56.935	2625.051	-3069.7	42.7	6938.9	-9.94	-0.07	2.20
662.0	5990.414	57.020	2638.933	-3089.6	42.6	6943.3	-9.94	-0.08	2.20
664.0	5984.214	57.105	2652.824	-3109.6	42.4	6947.7	-9.95	-0.08	2.21
666.0	5977.975	57.190	2666.724	-3129.5	42.2	6952.1	-9.99	-0.08	2.20
668.0	5971.696	57.274	2680.633	-3149.6	42.0	6956.5	-10.03	-0.08	2.19
670.0	5965.377	57.358	2694.550	-3169.7	41.9	6960.9	-10.04	-0.08	2.17

TABLE B-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XS KM	YS KM	ZS KM	DXS M/S	DYS M/S	DZS M/S	DDXS M/S SQ	DDYS M/S SQ	DDZS M/S SQ
672.0	5959.017	57.442	2708.477	-3189.8	41.7	6965.2	-10.01	-0.08	2.17
674.0	5952.618	57.525	2722.411	-3209.8	41.5	6969.6	-9.98	-0.07	2.17
676.0	5946.178	57.608	2736.355	-3229.8	41.4	6973.9	-9.97	-0.08	2.17
678.0	5939.699	57.690	2750.307	-3249.8	41.2	6978.3	-9.99	-0.08	2.16
680.0	5933.179	57.772	2764.268	-3269.8	41.0	6982.6	-10.00	-0.08	2.16
682.0	5926.620	57.854	2778.238	-3289.8	40.8	6986.9	-9.99	-0.08	2.16
684.0	5920.020	57.936	2792.216	-3309.8	40.7	6991.2	-9.97	-0.08	2.16
686.0	5913.381	58.017	2806.203	-3329.7	40.5	6995.6	-9.96	-0.08	2.16
688.0	5906.701	58.098	2820.198	-3349.7	40.3	6999.9	-9.94	-0.06	2.15
690.0	5899.982	58.178	2834.202	-3369.6	40.1	7004.2	-9.93	-0.07	2.15
692.0	5893.223	58.258	2848.215	-3389.5	39.9	7008.5	-9.91	-0.12	2.14
694.0	5886.424	58.338	2862.236	-3409.3	39.8	7012.8	-9.90	-0.10	2.14
S-IVB 1ST GUIDANCE CUTOFF									
694.670	5884.137	58.364	2866.936	-3415.9	39.7	7014.2	-9.89	-0.15	2.14
696.0	5879.586	58.417	2876.263	-3427.5	39.6	7010.5	-8.35	-0.06	-4.11
698.0	5872.714	58.496	2890.276	-3444.2	39.4	7002.3	-8.33	-0.06	-4.13
700.0	5865.809	58.575	2904.272	-3461.0	39.3	6994.1	-8.33	-0.06	-4.09
702.0	5858.870	58.653	2918.252	-3477.7	39.1	6985.8	-8.31	-0.06	-4.16
704.0	5851.898	58.731	2932.215	-3494.3	39.0	6977.5	-8.31	-0.06	-4.17
PARKING ORBIT INSERTION									
704.670	5849.555	58.757	2936.889	-3499.9	39.0	6974.7	-8.30	-0.06	-4.18

TABLE B-III. GEOGRAPHIC POLAR COORDINATES - ASCENT PHASE

TIME SEC	GC DIST KM	LONG DEG E	GC LAT DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
GUIDANCE REFERENCE RELEASE											
-16.939	6373.407	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	408.6	0	112
-16.0	6373.407	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	408.6	0	112
-15.0	6373.407	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	408.6	0	112
-14.0	6373.407	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	408.6	0	112
-13.0	6373.407	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	408.6	0	112
-12.0	6373.407	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	408.6	0	112
-11.0	6373.407	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	408.6	0	112
-10.0	6373.407	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	408.6	0	112
-9.0	6373.407	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	408.6	0	112
-8.0	6373.407	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	408.6	0	112
-7.0	6373.407	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	408.6	0	112
-6.0	6373.407	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	408.6	0	112
-5.0	6373.407	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	408.6	0	112
-4.0	6373.407	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	408.6	0	112
-3.0	6373.407	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	408.6	0	112
-2.0	6373.407	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	408.6	0	112
-1.0	6373.407	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	408.6	0	112
0.0	6373.407	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	408.6	0	112
ALL HOLODOWN ARMS RELEASED											
0.300	6373.407	-80.6041	28.4470	0.0	90.00	0.1	90.00	0.02	408.6	0	112
LIFTOFF - START OF TIME BASE 1											
0.600	6373.407	-80.6041	28.4470	301.25	89.47	0.5	90.00	0.07	408.6	0	112
1.0	6373.407	-80.6041	28.4470	257.34	89.51	1.1	90.00	0.16	408.6	0	112
2.0	6373.410	-80.6041	28.4470	220.90	88.99	3.5	90.01	0.49	408.6	0	114
3.0	6373.414	-80.6041	28.4470	207.95	88.80	5.8	90.02	0.82	408.6	0	119
4.0	6373.421	-80.6041	28.4470	201.71	88.56	8.3	90.03	1.16	408.6	0	126
5.0	6373.431	-80.6041	28.4470	195.74	88.30	10.7	90.04	1.51	408.7	0	136
6.0	6373.443	-80.6041	28.4470	193.05	88.10	13.3	90.06	1.86	408.8	0	148
7.0	6373.457	-80.6041	28.4470	190.63	87.79	15.9	90.08	2.22	408.8	1	162
8.0	6373.475	-80.6041	28.4469	188.23	87.20	18.5	90.13	2.60	408.9	2	179
9.0	6373.495	-80.6041	28.4469	186.51	86.78	21.3	90.17	2.98	409.1	3	199
10.0	6373.517	-80.6041	28.4469	185.48	86.68	24.1	90.20	3.37	409.2	4	222
11.0	6373.543	-80.6041	28.4469	184.47	86.82	27.0	90.21	3.78	409.4	5	247
12.0	6373.571	-80.6041	28.4469	182.88	87.05	30.0	90.22	4.20	409.7	7	276
13.0	6373.603	-80.6041	28.4469	180.42	87.23	33.0	90.22	4.62	410.0	8	307
14.0	6373.637	-80.6041	28.4469	177.33	87.34	36.1	90.23	5.04	410.3	10	342

TABLE B-III. GEOGRAPHIC POLAR COORDINATES - ASCENT PHASE (CONT.)

TIME SEC	GC DIST KM	LONG DEG E	GC LAT DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
15.0	6373.675	-80.6041	28.4469	173.89	87.46	39.2	90.24	5.47	410.7	12	379
16.0	6373.715	-80.6041	28.4468	170.34	87.63	42.3	90.24	5.90	411.1	13	420
17.0	6373.759	-80.6041	28.4468	166.18	87.87	45.6	90.23	6.35	411.6	15	464
18.0	6373.807	-80.6041	28.4468	160.38	88.12	48.9	90.21	6.81	412.1	17	511
19.0	6373.857	-80.6041	28.4468	152.71	88.29	52.2	90.19	7.27	412.7	18	562
20.0	6373.911	-80.6041	28.4468	144.19	88.38	55.7	90.18	7.74	413.4	20	616
21.0	6373.968	-80.6041	28.4468	135.56	88.42	59.2	90.16	8.22	414.1	21	673
22.0	6374.029	-80.6041	28.4468	127.15	88.38	62.8	90.15	8.70	414.9	22	734
23.0	6374.094	-80.6041	28.4468	119.01	88.29	66.5	90.13	9.19	415.8	23	799
24.0	6374.162	-80.6041	28.4467	111.95	88.14	70.2	90.12	9.69	416.8	25	867
25.0	6374.234	-80.6040	28.4467	105.87	87.96	74.0	90.10	10.20	417.8	26	939
26.0	6374.310	-80.6040	28.4467	100.72	87.73	77.9	90.08	10.71	419.0	28	1015
27.0	6374.390	-80.6040	28.4467	96.45	87.47	81.9	90.06	11.23	420.4	30	1095
28.0	6374.474	-80.6039	28.4467	93.02	87.16	86.0	90.03	11.75	421.8	33	1179
29.0	6374.562	-80.6039	28.4467	90.26	86.83	90.2	90.00	12.28	423.4	36	1267
30.0	6374.654	-80.6038	28.4467	88.09	86.47	94.4	89.97	12.81	425.1	39	1359
31.0	6374.750	-80.6037	28.4467	86.34	86.08	98.8	89.94	13.34	427.0	44	1455
32.0	6374.851	-80.6036	28.4467	84.92	85.66	103.2	89.90	13.88	429.0	50	1556
33.0	6374.956	-80.6035	28.4468	83.77	85.23	107.7	89.87	14.41	431.2	57	1661
34.0	6375.066	-80.6034	28.4468	82.85	84.77	112.3	89.83	14.95	433.6	65	1770
35.0	6375.180	-80.6033	28.4468	82.10	84.29	117.1	89.78	15.49	436.1	75	1885
36.0	6375.299	-80.6033	28.4468	81.51	83.79	121.9	89.74	16.03	438.9	86	2003
37.0	6375.423	-80.6031	28.4468	81.05	83.27	126.9	89.69	16.57	441.8	99	2127
38.0	6375.551	-80.6030	28.4468	80.69	82.74	131.9	89.64	17.10	444.9	114	2255
39.0	6375.684	-80.6028	28.4468	80.39	82.18	137.1	89.58	17.64	448.2	131	2389
40.0	6375.823	-80.6026	28.4469	80.15	81.61	142.3	89.53	18.16	451.8	150	2527
41.0	6375.966	-80.6024	28.4469	79.95	81.03	147.7	89.47	18.69	455.5	172	2670
42.0	6376.114	-80.6021	28.4469	79.78	80.43	153.3	89.40	19.20	459.5	196	2819
43.0	6376.268	-80.6019	28.4470	79.63	79.81	158.9	89.34	19.71	463.7	222	2973
44.0	6376.427	-80.6016	28.4470	79.51	79.17	164.7	89.27	20.21	468.1	251	3132
45.0	6376.592	-80.6012	28.4471	79.41	78.53	170.6	89.19	20.71	472.8	283	3296
46.0	6376.762	-80.6009	28.4472	79.32	77.87	176.6	89.11	21.19	477.7	318	3466
47.0	6376.937	-80.6005	28.4472	79.26	77.19	182.8	89.04	21.66	482.8	357	3642
48.0	6377.118	-80.6001	28.4473	79.23	76.51	189.1	88.96	22.12	488.2	399	3823
49.0	6377.305	-80.5996	28.4474	79.21	75.82	195.5	88.87	22.57	493.9	445	4010
50.0	6377.497	-80.5991	28.4474	79.22	75.12	202.1	88.79	23.01	499.8	494	4202
51.0	6377.696	-80.5986	28.4475	79.24	74.42	208.9	88.71	23.44	505.9	548	4400
52.0	6377.900	-80.5980	28.4476	79.28	73.70	215.8	88.62	23.85	512.3	606	4605
53.0	6378.110	-80.5973	28.4477	79.32	72.99	222.9	88.54	24.25	519.0	669	4815
54.0	6378.326	-80.5967	28.4479	79.37	72.27	230.1	88.45	24.63	525.9	736	5031
55.0	6378.548	-80.5959	28.4480	79.42	71.54	237.5	88.36	25.00	533.0	809	5253
56.0	6378.777	-80.5952	28.4481	79.47	70.82	245.1	88.27	25.36	540.5	887	5482
57.0	6379.011	-80.5943	28.4482	79.50	70.09	252.8	88.18	25.70	548.1	970	5716



TABLE B-III. GEOGRAPHIC POLAR COORDINATES - ASCENT PHASE (CONT.)

TIME SEC	GC DIST KM	LONG DEG E	GC LAT DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
58.0	6379.252	-80.5934	28.4484	79.53	69.36	260.7	88.09	26.03	556.1	1059	5957
59.0	6379.499	-80.5925	28.4485	79.55	68.63	268.8	87.99	26.34	564.2	1153	6204
60.0	6379.753	-80.5915	28.4487	79.56	67.90	277.0	87.88	26.63	572.7	1254	6458
61.0	6380.013	-80.5904	28.4489	79.56	67.17	285.5	87.78	26.91	581.3	1362	6718
62.0	6380.279	-80.5892	28.4491	79.56	66.44	294.0	87.68	27.17	590.2	1476	6984
63.0	6380.552	-80.5880	28.4493	79.56	65.72	302.8	87.57	27.42	599.3	1597	7257
64.0	6380.831	-80.5867	28.4495	79.56	65.00	311.6	87.46	27.65	608.6	1724	7536
MACH 1											
65.000	6381.117	-80.5854	28.4497	79.58	64.29	320.7	87.36	27.86	618.2	1860	7822
66.0	6381.409	-80.5839	28.4499	79.60	63.59	329.8	87.26	28.06	627.9	2002	8114
67.0	6381.707	-80.5824	28.4502	79.62	62.89	339.2	87.16	28.25	637.9	2153	8413
68.0	6382.013	-80.5808	28.4504	79.65	62.19	348.7	87.06	28.42	648.0	2311	8718
69.0	6382.324	-80.5792	28.4507	79.68	61.51	358.4	86.96	28.58	658.5	2478	9030
70.0	6382.643	-80.5774	28.4510	79.71	60.82	368.3	86.87	28.73	669.1	2653	9348
71.0	6382.968	-80.5755	28.4513	79.73	60.15	378.5	86.77	28.86	680.0	2836	9673
72.0	6383.299	-80.5736	28.4516	79.74	59.48	388.9	86.67	28.99	691.2	3029	10005
73.0	6383.638	-80.5716	28.4519	79.76	58.82	399.5	86.57	29.11	702.7	3231	10344
74.0	6383.983	-80.5695	28.4522	79.77	58.18	410.4	86.47	29.22	714.3	3442	10689
75.0	6384.335	-80.5672	28.4526	79.78	57.54	421.5	86.37	29.32	726.3	3663	11041
76.0	6384.694	-80.5649	28.4530	79.80	56.92	432.9	86.27	29.42	738.5	3894	11401
77.0	6385.061	-80.5625	28.4533	79.82	56.31	444.5	86.18	29.51	750.9	4135	11767
78.0	6385.434	-80.5600	28.4537	79.85	55.70	456.4	86.09	29.59	763.6	4386	12141
79.0	6385.815	-80.5573	28.4542	79.89	55.11	468.4	86.00	29.66	776.6	4648	12521
80.0	6386.202	-80.5546	28.4546	79.94	54.52	480.8	85.92	29.71	789.8	4921	12909
81.0	6386.598	-80.5517	28.4550	79.99	53.92	493.4	85.85	29.76	803.4	5205	13305
MAXIMUM DYNAMIC PRESSURE											
82.000	6387.000	-80.5487	28.4555	80.04	53.33	506.3	85.77	29.80	817.2	5501	13707
83.0	6387.410	-80.5456	28.4560	80.08	52.73	519.5	85.69	29.81	831.4	5809	14117
84.0	6387.827	-80.5424	28.4565	80.12	52.13	532.9	85.61	29.82	846.0	6129	14534
85.0	6388.251	-80.5390	28.4570	80.15	51.52	546.7	85.53	29.81	860.9	6462	14959
86.0	6388.683	-80.5356	28.4575	80.17	50.92	560.7	85.45	29.79	876.1	6808	15391
87.0	6389.122	-80.5319	28.4581	80.18	50.30	575.1	85.36	29.75	891.6	7167	15830
88.0	6389.568	-80.5282	28.4586	80.19	49.69	589.7	85.27	29.71	907.5	7541	16276
89.0	6390.021	-80.5243	28.4592	80.19	49.09	604.6	85.18	29.65	923.6	7928	16729
90.0	6390.482	-80.5202	28.4598	80.20	48.49	619.8	85.09	29.59	940.1	8331	17190
91.0	6390.949	-80.5160	28.4605	80.20	47.90	635.4	85.00	29.52	956.8	8748	17658
92.0	6391.424	-80.5117	28.4611	80.20	47.32	651.2	84.92	29.44	973.9	9180	18133
93.0	6391.907	-80.5071	28.4618	80.20	46.75	667.3	84.83	29.37	991.2	9628	18616
94.0	6392.397	-80.5025	28.4625	80.21	46.20	683.8	84.75	29.29	1008.8	10092	19106

TABLE B-III. GEOGRAPHIC POLAR COORDINATES - ASCENT PHASE (CONT.)

TIME SEC	GC DIST KM	LONG DEG E	GC LAT DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
95.0	6392.894	-80.4976	28.4633	80.21	45.65	700.5	84.67	29.20	1026.7	10572	19604
96.0	6393.399	-80.4926	28.4640	80.20	45.12	717.6	84.58	29.12	1044.9	11069	20108
97.0	6393.911	-80.4875	28.4648	80.20	44.59	734.9	84.50	29.03	1063.4	11582	20621
98.0	6394.430	-80.4821	28.4656	80.19	44.08	752.6	84.42	28.93	1082.2	12112	21141
99.0	6394.958	-80.4766	28.4665	80.18	43.57	770.5	84.34	28.83	1101.3	12660	21668
100.0	6395.493	-80.4709	28.4673	80.17	43.07	788.8	84.26	28.73	1120.7	13225	22204
101.0	6396.035	-80.4650	28.4682	80.17	42.57	807.4	84.18	28.62	1140.4	13808	22746
102.0	6396.585	-80.4590	28.4691	80.16	42.09	826.4	84.10	28.51	1160.4	14410	23297
103.0	6397.143	-80.4527	28.4701	80.16	41.61	845.6	84.03	28.40	1180.7	15030	23855
104.0	6397.708	-80.4463	28.4711	80.17	41.14	865.2	83.96	28.28	1201.4	15670	24420
105.0	6398.281	-80.4396	28.4721	80.17	40.68	885.1	83.90	28.16	1222.3	16329	24994
106.0	6398.862	-80.4328	28.4731	80.18	40.22	905.3	83.84	28.04	1243.6	17007	25575
107.0	6399.450	-80.4257	28.4742	80.19	39.78	925.8	83.78	27.92	1265.1	17706	26164
108.0	6400.047	-80.4185	28.4753	80.20	39.34	946.6	83.72	27.80	1287.0	18424	26760
109.0	6400.651	-80.4111	28.4764	80.21	38.92	967.8	83.66	27.67	1309.1	19164	27365
110.0	6401.263	-80.4034	28.4776	80.22	38.51	989.3	83.60	27.55	1331.6	19924	27977
111.0	6401.883	-80.3955	28.4788	80.23	38.10	1011.2	83.55	27.43	1354.4	20706	28597
112.0	6402.511	-80.3874	28.4800	80.23	37.71	1033.4	83.49	27.31	1377.5	21509	29226
113.0	6403.147	-80.3791	28.4813	80.24	37.33	1056.0	83.44	27.20	1401.0	22333	29862
114.0	6403.791	-80.3706	28.4826	80.24	36.95	1078.9	83.39	27.08	1424.8	23180	30507
115.0	6404.444	-80.3618	28.4839	80.25	36.58	1102.1	83.34	26.96	1448.9	24050	31160
116.0	6405.105	-80.3528	28.4852	80.26	36.22	1125.7	83.29	26.84	1473.3	24942	31822
117.0	6405.774	-80.3436	28.4866	80.27	35.86	1149.6	83.24	26.72	1498.1	25857	32491
118.0	6406.452	-80.3341	28.4881	80.27	35.51	1174.0	83.19	26.59	1523.2	26796	33169
119.0	6407.138	-80.3244	28.4895	80.28	35.15	1198.6	83.15	26.46	1548.8	27759	33856
120.0	6407.832	-80.3145	28.4910	80.29	34.81	1223.7	83.10	26.33	1574.7	28746	34551
121.0	6408.535	-80.3043	28.4926	80.29	34.46	1249.2	83.06	26.20	1601.0	29757	35254
122.0	6409.246	-80.2938	28.4941	80.30	34.12	1275.1	83.01	26.07	1627.7	30794	35965
123.0	6409.965	-80.2831	28.4957	80.30	33.78	1301.3	82.97	25.93	1654.7	31857	36685
124.0	6410.693	-80.2721	28.4974	80.31	33.45	1328.0	82.92	25.80	1682.2	32945	37414
125.0	6411.429	-80.2609	28.4991	80.31	33.12	1355.2	82.88	25.66	1710.2	34060	38150
126.0	6412.174	-80.2494	28.5008	80.31	32.80	1382.7	82.84	25.52	1738.5	35202	38896
127.0	6412.928	-80.2376	28.5026	80.32	32.49	1410.7	82.80	25.39	1767.2	36371	39650
128.0	6413.690	-80.2255	28.5044	80.32	32.18	1439.1	82.76	25.25	1796.4	37567	40412
129.0	6414.461	-80.2132	28.5062	80.33	31.87	1468.0	82.72	25.12	1826.0	38792	41184
130.0	6415.240	-80.2005	28.5081	80.34	31.57	1497.3	82.69	24.99	1856.1	40045	41964
131.0	6416.029	-80.1876	28.5101	80.35	31.28	1527.1	82.65	24.86	1886.6	41326	42753
132.0	6416.826	-80.1744	28.5120	80.35	31.00	1557.4	82.62	24.72	1917.5	42638	43551
133.0	6417.633	-80.1609	28.5140	80.36	30.71	1588.1	82.59	24.60	1948.9	43978	44358
134.0	6418.448	-80.1470	28.5161	80.37	30.44	1619.4	82.55	24.47	1980.8	45350	45175
135.0	6419.273	-80.1329	28.5182	80.37	30.17	1651.1	82.52	24.34	2013.2	46751	46000
S-IC CENTER ENGINE CUTOFF (ENGINE SOLENOID)											
135.960	6420.074	-80.1190	28.5203	80.38	29.91	1682.0	82.49	24.22	2044.7	48127	46802

TABLE B-III. GEOGRAPHIC POLAR COORDINATES - ASCENT PHASE (CONT.)

TIME SEC	GC DIST KM	LONG DEG E	GC LAT DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL M/S	HEAD DEG	FLI-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
136.0	6420.108	-80.1184	28.5204	80.38	29.90	1683.3	82.49	24.21	2046.1	48185	46836
137.0	6420.951	-80.1037	28.5226	80.39	29.64	1710.9	82.47	24.07	2074.3	49647	47679
138.0	6421.799	-80.0887	28.5248	80.40	29.38	1736.4	82.45	23.93	2100.4	51135	48528
139.0	6422.654	-80.0734	28.5271	80.41	29.14	1762.0	82.43	23.79	2126.7	52650	49383
140.0	6423.514	-80.0578	28.5294	80.42	28.90	1787.9	82.41	23.66	2153.2	54190	50245
141.0	6424.381	-80.0420	28.5317	80.43	28.66	1814.1	82.39	23.52	2180.0	55755	51112
142.0	6425.254	-80.0260	28.5341	80.44	28.43	1840.8	82.37	23.39	2207.3	57348	51986
143.0	6426.133	-80.0096	28.5365	80.45	28.20	1867.8	82.35	23.26	2234.9	58967	52865
144.0	6427.018	-79.9930	28.5390	80.46	27.97	1895.4	82.34	23.13	2263.0	60613	53752
145.0	6427.910	-79.9761	28.5415	80.47	27.74	1923.3	82.32	23.00	2291.5	62287	54644
146.0	6428.809	-79.9590	28.5440	80.48	27.52	1951.6	82.30	22.87	2320.4	63989	55544
147.0	6429.714	-79.9415	28.5466	80.49	27.30	1980.3	82.29	22.74	2349.7	65719	56449
148.0	6430.625	-79.9237	28.5492	80.50	27.09	2009.5	82.27	22.62	2379.4	67477	57362
149.0	6431.544	-79.9057	28.5518	80.51	26.88	2039.2	82.26	22.49	2409.6	69265	58281
150.0	6432.469	-79.8874	28.5545	80.52	26.67	2069.3	82.24	22.37	2440.2	71082	59207
151.0	6433.401	-79.8687	28.5573	80.53	26.46	2099.8	82.23	22.25	2471.2	72929	60140
152.0	6434.341	-79.8497	28.5600	80.54	26.26	2130.8	82.21	22.13	2502.8	74807	61081
153.0	6435.287	-79.8305	28.5629	80.55	26.06	2162.3	82.20	22.01	2534.7	76715	62028
154.0	6436.241	-79.8109	28.5657	80.56	25.86	2194.2	82.19	21.89	2567.2	78654	62982
155.0	6437.201	-79.7910	28.5686	80.58	25.67	2226.7	82.18	21.78	2600.1	80625	63944
156.0	6438.170	-79.7708	28.5716	80.59	25.48	2259.6	82.17	21.66	2633.5	82628	64914
157.0	6439.146	-79.7502	28.5746	80.60	25.29	2293.1	82.15	21.55	2667.4	84664	65890
158.0	6440.129	-79.7293	28.5776	80.61	25.11	2327.0	82.14	21.44	2701.8	86732	66875
159.0	6441.121	-79.7081	28.5807	80.62	24.93	2361.4	82.13	21.33	2736.6	88834	67867
S-IC OUTBOARD ENGINE CUTOFF (ENGINE SOLENOID)											
159.560	6441.679	-79.6961	28.5824	80.63	24.83	2380.9	82.13	21.27	2756.4	90025	68426
160.0	6442.119	-79.6866	28.5838	80.64	24.75	2388.8	82.13	21.21	2764.5	90966	68866
161.0	6443.115	-79.6649	28.5869	80.65	24.57	2386.7	82.14	21.05	2762.9	93112	69863
S-IC/S-II SEPARATION COMMAND											
161.200	6443.313	-79.6605	28.5876	80.65	24.54	2385.8	82.14	21.02	2762.2	93542	70062
162.0	6444.103	-79.6432	28.5901	80.67	24.39	2382.5	82.15	20.89	2759.3	95258	70852
164.0	6446.054	-79.5998	28.5963	80.70	24.03	2375.4	82.18	20.57	2753.2	99550	72806
166.0	6447.975	-79.5564	28.6025	80.72	23.66	2377.4	82.20	20.25	2756.3	103847	74729
168.0	6449.871	-79.5128	28.6088	80.75	23.31	2381.9	82.22	19.95	2761.7	108159	76627
170.0	6451.746	-79.4690	28.6150	80.78	22.96	2389.5	82.24	19.66	2770.2	112494	78503
172.0	6453.599	-79.4250	28.6213	80.81	22.61	2397.0	82.26	19.37	2778.7	116853	80359
174.0	6455.432	-79.3806	28.6276	80.85	22.26	2405.4	82.28	19.08	2788.0	121236	82193
176.0	6457.245	-79.3361	28.6339	80.88	21.92	2413.9	82.29	18.80	2797.4	125644	84008
178.0	6459.037	-79.2912	28.6402	80.91	21.59	2422.6	82.31	18.51	2807.0	130077	85803

TABLE B-III. GEOGRAPHIC POLAR COORDINATES - ASCENT PHASE (CONT.)

TIME SEC	GC DIST KM	LONG DEG E	GC LAT DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
180.0	6460.810	-79.2461	28.6465	80.94	21.25	2431.5	82.33	18.24	2816.7	134535	87577
182.0	6462.563	-79.2008	28.6528	80.97	20.92	2440.5	82.35	17.96	2826.5	139018	89332
184.0	6464.297	-79.1551	28.6592	81.00	20.60	2449.7	82.37	17.69	2836.5	143527	91068
186.0	6466.011	-79.1093	28.6656	81.03	20.28	2459.1	82.39	17.42	2846.7	148062	92784
188.0	6467.705	-79.0631	28.6719	81.07	19.96	2468.6	82.41	17.15	2857.0	152622	94481
190.0	6469.381	-79.0167	28.6783	81.10	19.64	2478.3	82.43	16.89	2867.5	157208	96158
192.0	6471.038	-78.9700	28.6847	81.13	19.33	2488.2	82.46	16.63	2878.1	161820	97817
194.0	6472.675	-78.9230	28.6911	81.16	19.02	2498.3	82.48	16.37	2888.9	166458	99457
196.0	6474.295	-78.8758	28.6976	81.19	18.72	2508.6	82.50	16.12	2899.8	171122	101078
198.0	6475.896	-78.8283	28.7040	81.23	18.42	2519.0	82.52	15.87	2910.9	175813	102681
200.0	6477.478	-78.7805	28.7105	81.26	18.12	2529.6	82.54	15.62	2922.2	180530	104266
202.0	6479.043	-78.7324	28.7170	81.29	17.83	2540.4	82.56	15.38	2933.7	185275	105832
204.0	6480.589	-78.6841	28.7234	81.32	17.54	2551.3	82.58	15.13	2945.2	190046	107381
206.0	6482.118	-78.6354	28.7299	81.36	17.25	2562.5	82.61	14.89	2957.0	194845	108912
208.0	6483.628	-78.5865	28.7364	81.39	16.95	2573.8	82.63	14.64	2968.9	199671	110424
210.0	6485.119	-78.5373	28.7430	81.42	16.65	2585.3	82.65	14.39	2981.1	204525	111917
212.0	6486.590	-78.4878	28.7495	81.46	16.34	2597.0	82.67	14.13	2993.4	209408	113390
214.0	6488.042	-78.4380	28.7560	81.49	16.04	2608.9	82.70	13.88	3005.9	214319	114844
216.0	6489.474	-78.3879	28.7626	81.53	15.74	2621.0	82.72	13.63	3018.6	219259	116278
218.0	6490.887	-78.3375	28.7692	81.56	15.45	2633.2	82.75	13.38	3031.3	224229	117693
220.0	6492.280	-78.2867	28.7757	81.60	15.16	2645.5	82.77	13.13	3044.3	229227	119088
222.0	6493.654	-78.2357	28.7823	81.63	14.87	2658.1	82.79	12.89	3057.3	234255	120464
224.0	6495.008	-78.1844	28.7889	81.67	14.58	2670.7	82.82	12.65	3070.5	239313	121820
226.0	6496.344	-78.1328	28.7955	81.71	14.30	2683.6	82.84	12.41	3083.9	244400	123158
228.0	6497.660	-78.0808	28.8022	81.74	14.02	2696.6	82.87	12.18	3097.4	249517	124477
230.0	6498.958	-78.0285	28.8088	81.78	13.75	2709.7	82.90	11.95	3111.0	254664	125776
232.0	6500.236	-77.9760	28.8154	81.81	13.48	2723.1	82.92	11.72	3124.8	259842	127057
234.0	6501.496	-77.9231	28.8221	81.85	13.21	2736.5	82.95	11.49	3138.8	265050	128319
236.0	6502.737	-77.8699	28.8288	81.88	12.94	2750.2	82.97	11.27	3152.9	270288	129562
238.0	6503.960	-77.8163	28.8354	81.92	12.68	2764.0	83.00	11.04	3167.1	275557	130787
240.0	6505.164	-77.7625	28.8421	81.96	12.42	2777.9	83.02	10.82	3181.5	280857	131993
242.0	6506.350	-77.7083	28.8488	81.99	12.16	2792.0	83.05	10.61	3196.0	286189	133181
244.0	6507.517	-77.6538	28.8555	82.03	11.91	2806.3	83.07	10.39	3210.7	291551	134350
246.0	6508.667	-77.5989	28.8622	82.06	11.66	2820.7	83.10	10.18	3225.5	296945	135502
248.0	6509.798	-77.5438	28.8689	82.10	11.41	2835.3	83.12	9.97	3240.4	302371	136635
250.0	6510.911	-77.4883	28.8757	82.13	11.17	2850.0	83.15	9.76	3255.5	307829	137750
252.0	6512.006	-77.4324	28.8824	82.17	10.93	2864.9	83.18	9.56	3270.7	313318	138848
254.0	6513.083	-77.3763	28.8892	82.21	10.69	2879.9	83.20	9.36	3286.1	318840	139927
256.0	6514.143	-77.3197	28.8957	82.24	10.46	2895.0	83.23	9.16	3301.6	324395	140989
258.0	6515.185	-77.2629	28.9027	82.28	10.23	2910.3	83.26	8.96	3317.2	329982	142033
260.0	6516.210	-77.2057	28.9094	82.32	10.00	2925.8	83.28	8.77	3333.0	335601	143060
262.0	6517.217	-77.1482	28.9162	82.35	9.77	2941.4	83.31	8.57	3348.9	341254	144069
264.0	6518.207	-77.0903	28.9230	82.39	9.55	2957.2	83.34	8.38	3365.0	346940	145061

TABLE B-III. GEOGRAPHIC POLAR COORDINATES - ASCENT PHASE (CONT.)

TIME SEC	GC DIST KM	LONG DEG E	GC LAT DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
266.0	6519.179	-77.0320	28.9298	82.43	9.33	2973.1	83.37	8.20	3381.2	352659	146036
268.0	6520.135	-76.9735	28.9366	82.47	9.11	2989.2	83.39	8.01	3397.5	358412	146994
270.0	6521.074	-76.9145	28.9434	82.50	8.90	3005.4	83.42	7.83	3414.0	364198	147935
272.0	6521.995	-76.8552	28.9502	82.54	8.69	3021.7	83.45	7.65	3430.6	370019	148858
274.0	6522.900	-76.7956	28.9570	82.58	8.48	3038.2	83.48	7.47	3447.4	375874	149765
276.0	6523.788	-76.7356	28.9639	82.62	8.28	3054.9	83.51	7.30	3464.3	381763	150656
278.0	6524.660	-76.6752	28.9707	82.65	8.08	3071.7	83.54	7.12	3481.3	387687	151530
280.0	6525.515	-76.6145	28.9775	82.69	7.88	3088.7	83.57	6.95	3498.5	393645	152387
282.0	6526.354	-76.5534	28.9843	82.73	7.69	3105.8	83.59	6.78	3515.8	399639	153228
284.0	6527.177	-76.4919	28.9912	82.77	7.49	3123.0	83.62	6.62	3533.3	405667	154053
286.0	6527.983	-76.4301	28.9980	82.81	7.30	3140.4	83.65	6.45	3550.9	411731	154861
288.0	6528.773	-76.3679	29.0049	82.84	7.12	3158.0	83.68	6.29	3568.6	417831	155654
290.0	6529.548	-76.3053	29.0117	82.88	6.93	3175.6	83.71	6.13	3586.5	423967	156431
292.0	6530.306	-76.2423	29.0186	82.92	6.75	3193.5	83.74	5.98	3604.6	430139	157191
294.0	6531.049	-76.1790	29.0255	82.96	6.57	3211.5	83.77	5.82	3622.7	436347	157936
296.0	6531.777	-76.1152	29.0323	83.00	6.40	3229.6	83.80	5.67	3641.1	442592	158666
298.0	6532.488	-76.0511	29.0392	83.04	6.22	3247.9	83.83	5.52	3659.5	448873	159380
300.0	6533.185	-75.9866	29.0460	83.08	6.05	3266.4	83.86	5.37	3678.1	455192	160078
302.0	6533.866	-75.9217	29.0529	83.12	5.88	3285.0	83.90	5.23	3696.9	461547	160762
304.0	6534.532	-75.8565	29.0598	83.16	5.72	3303.7	83.93	5.08	3715.8	467940	161430
306.0	6535.183	-75.7908	29.0666	83.20	5.56	3322.6	83.96	4.94	3734.8	474371	162083
308.0	6535.819	-75.7247	29.0735	83.24	5.40	3341.7	83.99	4.80	3754.0	480840	162721
310.0	6536.440	-75.6582	29.0804	83.28	5.24	3360.9	84.02	4.67	3773.3	487347	163345
312.0	6537.047	-75.5914	29.0872	83.32	5.09	3380.2	84.05	4.53	3792.8	493893	163953
314.0	6537.639	-75.5241	29.0941	83.36	4.93	3399.7	84.09	4.40	3812.4	500477	164548
316.0	6538.216	-75.4564	29.1010	83.40	4.78	3419.4	84.12	4.27	3832.2	507100	165127
318.0	6538.780	-75.3883	29.1078	83.44	4.64	3439.2	84.15	4.14	3852.1	513762	165693
320.0	6539.329	-75.3198	29.1147	83.49	4.49	3459.1	84.19	4.01	3872.2	520464	166244
322.0	6539.864	-75.2508	29.1215	83.53	4.35	3479.2	84.22	3.89	3892.4	527205	166781
324.0	6540.385	-75.1815	29.1284	83.57	4.21	3499.5	84.25	3.77	3912.8	533987	167305
326.0	6540.892	-75.1117	29.1352	83.61	4.08	3519.9	84.29	3.65	3933.3	540808	167814
328.0	6541.386	-75.0415	29.1421	83.65	3.94	3540.5	84.32	3.53	3954.0	547670	168310
330.0	6541.866	-74.9709	29.1489	83.69	3.81	3561.2	84.36	3.41	3974.8	554573	168792
332.0	6542.332	-74.8998	29.1557	83.74	3.68	3582.1	84.39	3.30	3995.8	561517	169261
334.0	6542.785	-74.8284	29.1626	83.78	3.55	3603.2	84.42	3.19	4016.9	568502	169716
336.0	6543.225	-74.7564	29.1694	83.82	3.43	3624.4	84.46	3.08	4038.2	575528	170158
338.0	6543.652	-74.6841	29.1762	83.87	3.31	3645.7	84.49	2.97	4059.6	582597	170587
340.0	6544.066	-74.6113	29.1830	83.91	3.19	3667.3	84.53	2.86	4081.2	589707	171004
342.0	6544.468	-74.5380	29.1898	83.95	3.07	3689.0	84.57	2.76	4103.0	596860	171407
344.0	6544.856	-74.4643	29.1966	84.00	2.95	3710.8	84.60	2.66	4124.9	604056	171798
346.0	6545.232	-74.3902	29.2034	84.04	2.84	3732.8	84.64	2.56	4147.0	611294	172176
348.0	6545.596	-74.3156	29.2102	84.08	2.73	3755.0	84.67	2.46	4169.2	618576	172542
350.0	6545.947	-74.2405	29.2169	84.13	2.62	3777.3	84.71	2.36	4191.6	625902	172895

TABLE B-III. GEOGRAPHIC POLAR COORDINATES - ASCENT PHASE (CONT.)

TIME SEC	GC DIST KM	LONG DEG E	GC LAT DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
352.0	6546.287	-74.1650	29.2237	84.17	2.51	3799.9	84.75	2.27	4214.2	633271	173237
354.0	6546.614	-74.0890	29.2304	84.22	2.41	3822.5	84.79	2.17	4236.9	640684	173566
356.0	6546.930	-74.0126	29.2371	84.26	2.31	3845.4	84.82	2.08	4259.8	648142	173884
358.0	6547.234	-73.9356	29.2439	84.31	2.21	3868.4	84.86	1.99	4282.8	655645	174190
360.0	6547.526	-73.8583	29.2506	84.35	2.11	3891.6	84.90	1.91	4306.0	663192	174485
362.0	6547.807	-73.7804	29.2573	84.40	2.02	3914.9	84.94	1.82	4329.4	670785	174768
364.0	6548.077	-73.7020	29.2639	84.45	1.92	3938.4	84.98	1.74	4353.0	678424	175040
366.0	6548.336	-73.6232	29.2706	84.49	1.83	3962.1	85.02	1.66	4376.7	686109	175301
368.0	6548.584	-73.5439	29.2772	84.54	1.74	3986.0	85.06	1.58	4400.6	693840	175551
370.0	6548.821	-73.4641	29.2839	84.59	1.66	4010.0	85.10	1.50	4424.7	701618	175790
372.0	6549.047	-73.3838	29.2905	84.63	1.57	4034.3	85.13	1.42	4449.0	709443	176019
374.0	6549.263	-73.3030	29.2971	84.68	1.49	4058.7	85.17	1.35	4473.4	717315	176237
376.0	6549.469	-73.2217	29.3036	84.73	1.41	4083.2	85.21	1.28	4498.0	725235	176445
378.0	6549.664	-73.1399	29.3102	84.77	1.33	4108.0	85.26	1.21	4522.8	733203	176642
380.0	6549.850	-73.0575	29.3167	84.82	1.25	4133.0	85.30	1.14	4547.8	741219	176830
382.0	6550.026	-72.9747	29.3232	84.87	1.18	4158.1	85.34	1.07	4573.0	749285	177008
384.0	6550.192	-72.8914	29.3297	84.92	1.10	4183.4	85.38	1.00	4598.3	757399	177176
386.0	6550.348	-72.8075	29.3362	84.97	1.03	4209.0	85.42	0.94	4623.3	765562	177334
388.0	6550.495	-72.7231	29.3426	85.02	0.96	4234.7	85.46	0.88	4649.6	773776	177483
390.0	6550.633	-72.6382	29.3491	85.07	0.90	4260.6	85.50	0.82	4675.5	782039	177623
392.0	6550.762	-72.5528	29.3555	85.11	0.83	4286.7	85.55	0.76	4701.6	790353	177754
394.0	6550.882	-72.4668	29.3618	85.16	0.77	4312.9	85.59	0.70	4727.9	798719	177876
396.0	6550.993	-72.3803	29.3682	85.21	0.71	4339.4	85.63	0.65	4754.4	807135	177990
398.0	6551.096	-72.2932	29.3745	85.26	0.65	4366.1	85.67	0.59	4781.1	815603	178095
400.0	6551.191	-72.2056	29.3808	85.31	0.59	4393.0	85.72	0.54	4808.0	824123	178191
402.0	6551.278	-72.1174	29.3871	85.36	0.53	4420.1	85.76	0.49	4835.1	832696	178280
404.0	6551.356	-72.0287	29.3933	85.41	0.48	4447.4	85.81	0.44	4862.4	841321	178360
406.0	6551.427	-71.9394	29.3995	85.46	0.43	4474.9	85.85	0.39	4889.9	850000	178433
408.0	6551.490	-71.8496	29.4057	85.51	0.38	4502.6	85.89	0.35	4917.6	858733	178499
410.0	6551.546	-71.7592	29.4118	85.57	0.33	4530.6	85.94	0.30	4945.6	867519	178556
412.0	6551.595	-71.6682	29.4179	85.62	0.28	4558.7	85.98	0.26	4973.7	876360	178607
414.0	6551.637	-71.5767	29.4240	85.67	0.24	4587.1	86.03	0.22	5002.1	885256	178651
416.0	6551.672	-71.4845	29.4300	85.72	0.20	4615.7	86.07	0.18	5030.7	894208	178688
418.0	6551.700	-71.3918	29.4360	85.77	0.16	4644.5	86.12	0.14	5059.5	903215	178718
420.0	6551.722	-71.2985	29.4420	85.83	0.12	4673.5	86.17	0.11	5088.5	912278	178742
422.0	6551.738	-71.2046	29.4479	85.88	0.08	4702.8	86.21	0.07	5117.8	921398	178760
424.0	6551.748	-71.1101	29.4538	85.93	0.04	4732.2	86.26	0.04	5147.3	930576	178772
426.0	6551.752	-71.0149	29.4597	85.99	0.01	4762.0	86.31	0.01	5177.0	939811	178778
428.0	6551.751	-70.9192	29.4655	86.04	-0.02	4791.9	86.36	-0.02	5207.0	949103	178779
430.0	6551.745	-70.8229	29.4713	86.09	-0.05	4822.1	86.40	-0.05	5237.2	958455	178774
432.0	6551.733	-70.7259	29.4770	86.15	-0.08	4852.6	86.45	-0.08	5267.6	967865	178764
434.0	6551.717	-70.6283	29.4827	86.20	-0.11	4883.3	86.50	-0.10	5298.3	977335	178750
436.0	6551.696	-70.5301	29.4883	86.26	-0.14	4914.2	86.55	-0.12	5329.2	986865	178730

TABLE B-III. GEOGRAPHIC POLAR COORDINATES - ASCENT PHASE (CONT.)

TIME SEC	GC DIST KM	LONG DEG E	GC LAT DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
438.0	6551.670	-70.4313	29.4939	86.31	-0.16	4945.4	86.60	-0.15	5360.4	996455	178707
440.0	6551.641	-70.3318	29.4994	86.37	-0.18	4976.8	86.65	-0.17	5391.9	1006106	178679
442.0	6551.607	-70.2316	29.5049	86.42	-0.20	5008.5	86.70	-0.19	5423.6	1015819	178648
444.0	6551.571	-70.1308	29.5104	86.48	-0.22	5040.5	86.75	-0.20	5455.5	1025593	178612
446.0	6551.530	-70.0294	29.5157	86.54	-0.24	5072.7	86.80	-0.22	5487.8	1035431	178574
448.0	6551.487	-69.9273	29.5211	86.59	-0.25	5105.2	86.85	-0.23	5520.2	1045331	178532
450.0	6551.440	-69.8245	29.5264	86.65	-0.27	5138.0	86.90	-0.25	5553.0	1055294	178487
452.0	6551.392	-69.7211	29.5316	86.71	-0.28	5171.0	86.95	-0.26	5586.0	1065322	178440
454.0	6551.340	-69.6170	29.5368	86.76	-0.29	5204.3	87.00	-0.27	5619.3	1075414	178391
456.0	6551.287	-69.5122	29.5419	86.82	-0.30	5237.9	87.06	-0.27	5652.9	1085572	178339
458.0	6551.232	-69.4067	29.5469	86.88	-0.30	5271.8	87.11	-0.28	5686.8	1095795	178286
459.560	6551.188	-69.3239	29.5508	86.93	-0.31	5298.4	87.15	-0.29	5713.4	1103815	178243
S-II CENTER ENGINE CUTOFF (ENGINE SOLENOID)											
460.0	6551.176	-69.3005	29.5519	86.94	-0.31	5305.2	87.16	-0.29	5720.2	1106084	178231
462.0	6551.116	-69.1937	29.5568	87.00	-0.33	5332.9	87.22	-0.31	5747.9	1116432	178173
464.0	6551.053	-69.0863	29.5617	87.06	-0.35	5360.7	87.27	-0.33	5775.7	1126835	178111
466.0	6550.985	-68.9784	29.5664	87.12	-0.37	5388.6	87.32	-0.34	5803.6	1137291	178045
468.0	6550.914	-68.8698	29.5711	87.18	-0.38	5416.7	87.38	-0.36	5831.7	1147802	177975
470.0	6550.840	-68.7608	29.5758	87.24	-0.39	5444.8	87.43	-0.37	5859.8	1158368	177903
472.0	6550.765	-68.6511	29.5803	87.30	-0.39	5473.0	87.49	-0.37	5888.0	1168990	177829
474.0	6550.690	-68.5408	29.5848	87.36	-0.38	5501.4	87.54	-0.36	5916.4	1179666	177756
476.0	6550.618	-68.4300	29.5892	87.42	-0.37	5529.6	87.60	-0.34	5944.6	1190397	177685
478.0	6550.549	-68.3186	29.5935	87.48	-0.35	5558.1	87.65	-0.32	5973.0	1201183	177618
480.0	6550.483	-68.2066	29.5978	87.54	-0.33	5586.6	87.71	-0.31	6001.6	1212026	177553
482.0	6550.420	-68.0940	29.6019	87.60	-0.31	5615.4	87.76	-0.29	6030.4	1222924	177491
484.0	6550.361	-67.9808	29.6060	87.66	-0.29	5644.4	87.82	-0.27	6059.4	1233879	177433
486.0	6550.304	-67.8671	29.6100	87.72	-0.28	5670.6	87.88	-0.26	6085.6	1244888	177378
488.0	6550.249	-67.7528	29.6139	87.79	-0.28	5696.4	87.94	-0.26	6111.4	1255947	177324
490.0	6550.194	-67.6380	29.6177	87.85	-0.27	5722.3	88.00	-0.25	6137.3	1267056	177270
492.0	6550.140	-67.5226	29.6214	87.91	-0.27	5748.4	88.05	-0.25	6163.3	1278217	177218
494.0	6550.087	-67.4067	29.6250	87.98	-0.26	5774.8	88.11	-0.24	6189.7	1289428	177166
496.0	6550.035	-67.2903	29.6285	88.04	-0.25	5801.2	88.17	-0.24	6216.1	1300690	177115
498.0	6549.984	-67.1734	29.6319	88.11	-0.25	5827.8	88.23	-0.23	6242.7	1312004	177065
500.0	6549.934	-67.0559	29.6353	88.17	-0.25	5854.6	88.29	-0.23	6269.6	1323370	177016
502.0	6549.884	-66.9378	29.6385	88.24	-0.24	5881.7	88.35	-0.23	6296.7	1334789	176967
504.0	6549.834	-66.8192	29.6416	88.30	-0.24	5909.0	88.41	-0.23	6324.0	1346261	176918
506.0	6549.785	-66.7000	29.6446	88.37	-0.24	5936.5	88.48	-0.22	6351.5	1357786	176870
508.0	6549.735	-66.5803	29.6475	88.43	-0.23	5964.2	88.54	-0.22	6379.2	1369365	176821
510.0	6549.687	-66.4600	29.6503	88.50	-0.23	5992.1	88.60	-0.22	6407.1	1380998	176774
512.0	6549.639	-66.3391	29.6530	88.57	-0.23	6020.2	88.66	-0.21	6435.2	1392686	176727
514.0	6549.592	-66.2176	29.6556	88.63	-0.22	6048.6	88.72	-0.21	6463.5	1404428	176681

TABLE B-III. GEOGRAPHIC POLAR COORDINATES - ASCENT PHASE (CONT.)

TIME SEC	GC DIST KM	LONG DEG E	GC LAT DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
516.0	6549.547	-66.0956	29.6580	88.70	-0.21	6077.1	88.78	-0.20	6492.0	1416226	176636
518.0	6549.502	-65.9730	29.6604	88.77	-0.20	6105.8	88.85	-0.19	6520.7	1428080	176592
520.0	6549.460	-65.8498	29.6626	88.84	-0.20	6134.7	88.91	-0.18	6549.6	1439990	176551
522.0	6549.419	-65.7260	29.6647	88.91	-0.19	6163.8	88.97	-0.17	6578.8	1451957	176510
524.0	6549.380	-65.6016	29.6667	88.97	-0.17	6193.2	89.04	-0.16	6608.1	1463980	176472
526.0	6549.344	-65.4766	29.6686	89.04	-0.16	6222.7	89.10	-0.15	6637.7	1476061	176436
528.0	6549.310	-65.3510	29.6704	89.11	-0.15	6252.5	89.17	-0.14	6667.4	1488200	176403
530.0	6549.279	-65.2249	29.6720	89.18	-0.13	6282.5	89.23	-0.13	6697.4	1500397	176373
532.0	6549.251	-65.0981	29.6735	89.25	-0.12	6312.7	89.30	-0.11	6727.6	1512653	176345
534.0	6549.227	-64.9706	29.6749	89.32	-0.10	6343.1	89.36	-0.10	6758.0	1524967	176321
536.0	6549.206	-64.8426	29.6762	89.39	-0.08	6373.7	89.43	-0.08	6788.6	1537341	176301
538.0	6549.189	-64.7139	29.6773	89.46	-0.06	6404.6	89.49	-0.06	6819.5	1549775	176285
540.0	6549.177	-64.5846	29.6783	89.53	-0.04	6435.6	89.56	-0.04	6850.6	1562269	176273
542.0	6549.170	-64.4547	29.6791	89.60	-0.02	6467.0	89.63	-0.02	6882.0	1574824	176266
544.0	6549.167	-64.3242	29.6798	89.67	-0.00	6498.7	89.69	-0.00	6913.6	1587440	176263
546.0	6549.169	-64.1930	29.6804	89.75	0.02	6530.6	89.76	0.02	6945.5	1600118	176266
548.0	6549.177	-64.0611	29.6808	89.82	0.05	6562.9	89.83	0.05	6977.8	1612858	176274
S-II OUTBOARD ENGINE CUTOFF (ENGINE SOLENOID)											
549.060	6549.183	-63.9910	29.6810	89.85	0.06	6580.1	89.86	0.06	6995.0	1619633	176280
550.0	6549.189	-63.9288	29.6811	89.89	0.05	6584.1	89.90	0.05	6999.0	1625649	176286
S-II/S-IVB SEPARATION COMMAND											
550.100	6549.189	-63.9221	29.6811	89.89	0.05	6584.0	89.90	0.05	6999.0	1626289	176286
552.0	6549.197	-63.7962	29.6813	89.96	0.02	6582.6	89.97	0.02	6997.5	1638457	176293
554.0	6549.197	-63.6637	29.6813	90.04	-0.02	6581.5	90.04	-0.02	6996.4	1651265	176294
556.0	6549.191	-63.5311	29.6811	90.11	-0.03	6588.3	90.11	-0.03	7003.2	1664078	176288
558.0	6549.182	-63.3983	29.6808	90.19	-0.05	6598.1	90.17	-0.04	7013.0	1676909	176279
560.0	6549.171	-63.2653	29.6804	90.26	-0.06	6608.1	90.24	-0.06	7023.1	1689759	176267
562.0	6549.156	-63.1321	29.6798	90.33	-0.07	6618.4	90.31	-0.07	7033.3	1702629	176252
564.0	6549.138	-62.9987	29.6790	90.40	-0.08	6628.8	90.38	-0.08	7043.7	1715520	176234
566.0	6549.117	-62.8651	29.6781	90.48	-0.10	6639.2	90.45	-0.09	7054.1	1728430	176213
568.0	6549.093	-62.7313	29.6771	90.55	-0.11	6649.8	90.52	-0.10	7064.7	1741361	176188
570.0	6549.066	-62.5973	29.6759	90.62	-0.12	6660.3	90.59	-0.11	7075.3	1754313	176161
572.0	6549.037	-62.4631	29.6746	90.70	-0.13	6671.0	90.66	-0.13	7085.9	1767285	176131
574.0	6549.004	-62.3287	29.6731	90.77	-0.15	6681.7	90.73	-0.14	7096.6	1780278	176098
576.0	6548.969	-62.1940	29.6714	90.85	-0.16	6692.4	90.80	-0.15	7107.3	1793293	176063
578.0	6548.931	-62.0591	29.6696	90.92	-0.17	6703.2	90.87	-0.16	7118.1	1806328	176024
580.0	6548.890	-61.9241	29.6676	91.00	-0.18	6714.0	90.94	-0.17	7128.9	1819384	175982
582.0	6548.847	-61.7888	29.6655	91.07	-0.19	6724.8	91.01	-0.18	7139.7	1832461	175938
584.0	6548.800	-61.6533	29.6632	91.15	-0.20	6735.6	91.08	-0.19	7150.5	1845559	175891



TABLE B-III. GEOGRAPHIC POLAR COORDINATES - ASCENT PHASE (CONT.)

TIME SEC	GC DIST KM	LONG DEG E	GC LAT DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
586.0	6548.752	-61.5176	29.6608	91.22	-0.21	6746.5	91.15	-0.20	7161.4	1858679	175842
588.0	6548.700	-61.3816	29.6582	91.30	-0.22	6757.5	91.22	-0.21	7172.4	1871820	175790
590.0	6548.647	-61.2455	29.6554	91.37	-0.23	6768.5	91.30	-0.22	7183.3	1884982	175735
592.0	6548.591	-61.1091	29.6525	91.45	-0.24	6779.5	91.37	-0.23	7194.4	1898166	175679
594.0	6548.534	-60.9726	29.6494	91.53	-0.25	6790.5	91.44	-0.23	7205.4	1911372	175620
596.0	6548.474	-60.8358	29.6462	91.60	-0.25	6801.6	91.51	-0.24	7216.5	1924599	175560
598.0	6548.413	-60.6988	29.6428	91.68	-0.26	6812.8	91.58	-0.25	7227.6	1937848	175497
600.0	6548.350	-60.5616	29.6392	91.75	-0.27	6824.0	91.65	-0.25	7238.8	1951118	175433
602.0	6548.285	-60.4241	29.6354	91.83	-0.27	6835.2	91.73	-0.26	7250.0	1964411	175367
604.0	6548.219	-60.2865	29.6315	91.91	-0.28	6846.4	91.80	-0.26	7261.3	1977726	175300
606.0	6548.151	-60.1486	29.6275	91.98	-0.29	6857.7	91.87	-0.27	7272.5	1991063	175231
608.0	6548.082	-60.0105	29.6232	92.06	-0.29	6869.0	91.94	-0.27	7283.8	2004421	175160
610.0	6548.011	-59.8722	29.6188	92.14	-0.30	6880.3	92.02	-0.28	7295.1	2017802	175088
612.0	6547.940	-59.7337	29.6142	92.21	-0.30	6891.6	92.09	-0.28	7306.4	2031205	175015
614.0	6547.867	-59.5950	29.6095	92.29	-0.30	6903.0	92.16	-0.29	7317.8	2044631	174941
616.0	6547.794	-59.4560	29.6046	92.37	-0.31	6914.4	92.23	-0.29	7329.2	2058079	174866
618.0	6547.720	-59.3169	29.5995	92.45	-0.31	6925.9	92.31	-0.29	7340.7	2071549	174790
620.0	6547.645	-59.1775	29.5942	92.52	-0.31	6937.4	92.38	-0.29	7352.2	2085041	174714
622.0	6547.570	-59.0379	29.5888	92.60	-0.31	6948.9	92.45	-0.29	7363.7	2098556	174637
624.0	6547.494	-58.8981	29.5832	92.68	-0.31	6960.4	92.53	-0.29	7375.2	2112094	174560
626.0	6547.419	-58.7580	29.5774	92.75	-0.31	6972.0	92.60	-0.29	7386.8	2125655	174482
628.0	6547.343	-58.6178	29.5715	92.83	-0.31	6983.6	92.67	-0.29	7398.4	2139238	174404
630.0	6547.267	-58.4773	29.5654	92.91	-0.31	6995.2	92.75	-0.29	7410.0	2152844	174326
632.0	6547.191	-58.3366	29.5591	92.99	-0.31	7006.9	92.82	-0.29	7421.6	2166472	174249
634.0	6547.115	-58.1957	29.5526	93.06	-0.31	7018.6	92.89	-0.29	7433.3	2180124	174171
636.0	6547.040	-58.0546	29.5459	93.14	-0.31	7030.3	92.97	-0.29	7445.0	2193798	174093
638.0	6546.966	-57.9133	29.5391	93.22	-0.30	7042.0	93.04	-0.29	7456.7	2207496	174017
640.0	6546.892	-57.7717	29.5321	93.30	-0.30	7053.7	93.11	-0.28	7468.5	2221216	173941
642.0	6546.819	-57.6299	29.5249	93.37	-0.29	7065.5	93.19	-0.28	7480.2	2234960	173865
644.0	6546.747	-57.4880	29.5175	93.45	-0.29	7077.3	93.26	-0.27	7492.0	2248726	173791
646.0	6546.676	-57.3458	29.5100	93.53	-0.28	7089.2	93.33	-0.27	7503.9	2262516	173717
648.0	6546.606	-57.2033	29.5023	93.61	-0.27	7101.1	93.41	-0.26	7515.8	2276329	173645
650.0	6546.538	-57.0607	29.4943	93.68	-0.27	7113.0	93.48	-0.26	7527.7	2290166	173575
652.0	6546.471	-56.9178	29.4863	93.76	-0.27	7125.0	93.56	-0.25	7539.7	2304026	173505
654.0	6546.406	-56.7748	29.4780	93.84	-0.26	7136.9	93.63	-0.24	7551.6	2317909	173437
656.0	6546.343	-56.6315	29.4695	93.92	-0.25	7148.9	93.70	-0.24	7563.6	2331816	173371
658.0	6546.281	-56.4880	29.4609	94.00	-0.24	7161.0	93.78	-0.23	7575.6	2345746	173307
660.0	6546.222	-56.3442	29.4520	94.08	-0.23	7173.0	93.85	-0.22	7587.7	2359700	173245
662.0	6546.165	-56.2003	29.4430	94.15	-0.22	7185.1	93.93	-0.21	7599.8	2373678	173185
664.0	6546.110	-56.0561	29.4338	94.23	-0.21	7197.3	94.00	-0.20	7612.0	2387679	173128
666.0	6546.058	-55.9118	29.4244	94.31	-0.20	7209.5	94.07	-0.19	7624.2	2401705	173072
668.0	6546.009	-55.7672	29.4149	94.39	-0.19	7221.8	94.15	-0.18	7636.4	2415754	173020
670.0	6545.962	-55.6224	29.4051	94.47	-0.18	7234.1	94.22	-0.17	7648.7	2429827	172970

TABLE B-III. GEOGRAPHIC POLAR COORDINATES - ASCENT PHASE (CONT.)

TIME SEC	GC DIST KM	LONG DEG E	GC LAT DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
672.0	6545.917	-55.4773	29.3951	94.54	-0.17	7246.4	94.30	-0.16	7661.0	2443924	172922
674.0	6545.876	-55.3321	29.3850	94.62	-0.16	7258.7	94.37	-0.15	7673.3	2458046	172878
676.0	6545.838	-55.1866	29.3746	94.70	-0.14	7271.0	94.45	-0.14	7685.6	2472191	172836
678.0	6545.803	-55.0409	29.3641	94.78	-0.13	7283.4	94.52	-0.12	7698.0	2486361	172798
680.0	6545.772	-54.8950	29.3534	94.86	-0.12	7295.8	94.60	-0.11	7710.4	2500554	172764
682.0	6545.745	-54.7489	29.3425	94.94	-0.10	7308.2	94.67	-0.09	7722.8	2514772	172733
684.0	6545.721	-54.6026	29.3314	95.02	-0.08	7320.6	94.75	-0.08	7735.2	2529015	172706
686.0	6545.702	-54.4560	29.3201	95.10	-0.07	7333.1	94.82	-0.06	7747.7	2543281	172682
688.0	6545.686	-54.3093	29.3086	95.18	-0.05	7345.6	94.90	-0.05	7760.2	2557572	172664
690.0	6545.676	-54.1623	29.2969	95.25	-0.03	7358.1	94.97	-0.03	7772.7	2571887	172649
692.0	6545.670	-54.0151	29.2850	95.33	-0.01	7370.6	95.05	-0.01	7785.2	2586227	172640
694.0	6545.669	-53.8677	29.2729	95.41	0.01	7383.1	95.12	0.01	7797.7	2600591	172635
S-IVB 1ST GUIDANCE CUTOFF											
694.670	6545.670	-53.8183	29.2688	95.44	0.01	7387.3	95.15	0.01	7801.9	2605409	172634
696.0	6545.673	-53.7201	29.2606	95.49	0.02	7389.0	95.20	0.02	7803.6	2614977	172635
698.0	6545.677	-53.5725	29.2481	95.57	0.02	7389.0	95.28	0.02	7803.6	2629364	172635
700.0	6545.681	-53.4250	29.2355	95.65	0.02	7389.1	95.35	0.02	7803.7	2643752	172635
702.0	6545.685	-53.2775	29.2226	95.73	0.02	7389.1	95.43	0.02	7803.7	2658140	172635
704.0	6545.689	-53.1300	29.2096	95.81	0.02	7389.1	95.51	0.02	7803.7	2672528	172635
PARKING ORBIT INSERTION											
704.670	6545.691	-53.0807	29.2052	95.84	0.02	7389.1	95.53	0.02	7803.7	2677348	172635

TABLE B-IV. GEOGRAPHIC POLAR COORDINATES - PARKING ORBIT PHASE

TIME SEC	GC DIST KM	LONG DEG E	GC LAT DEG N	GD LAT DEG N	HEAD DEG	FLT-PATH DEG	SF VEL M/S	ALTITUDE KM
704.670	6545.691	-53.0807	29.2052	29.3650	95.53	0.02	7803.7	172.635
PARKING ORBIT INSERTION								
750.0	6545.831	-49.7508	28.8606	29.0192	97.24	0.01	7803.9	172.666
800.0	6545.921	-46.1083	28.3750	28.5320	99.09	0.01	7804.1	172.603
850.0	6546.003	-42.5048	27.7821	27.9369	100.89	0.01	7804.2	172.501
900.0	6546.079	-38.9462	27.0855	27.2377	102.63	0.01	7804.3	172.363
950.0	6546.147	-35.4376	26.2895	26.4386	104.31	0.01	7804.4	172.193
1000.0	6546.209	-31.9825	25.3990	25.5444	105.91	0.01	7804.6	171.993
1050.0	6546.263	-28.5839	24.4187	24.5601	107.43	0.01	7804.7	171.766
1100.0	6546.308	-25.2432	23.3542	23.4908	108.88	0.01	7804.9	171.517
1150.0	6546.345	-21.9611	22.2107	22.3421	110.23	0.00	7805.1	171.248
1200.0	6546.374	-18.7372	20.9937	21.1194	111.50	0.00	7805.3	170.964
1250.0	6546.393	-15.5703	19.7090	19.8282	112.68	0.00	7805.5	170.670
1300.0	6546.402	-12.4585	18.3619	18.4742	113.76	0.00	7805.7	170.368
1350.0	6546.402	-9.3991	16.9579	17.0628	114.76	-0.00	7806.0	170.064
1400.0	6546.392	-6.3891	15.5026	15.5994	115.66	-0.00	7806.2	169.761
1450.0	6546.372	-3.4247	14.0012	14.0894	116.47	-0.00	7806.5	169.464
1500.0	6546.342	-0.5021	12.4589	12.5381	117.19	-0.01	7806.7	169.176
1550.0	6546.302	2.3832	10.8808	10.9505	117.82	-0.01	7806.9	168.901
1600.0	6546.251	5.2357	9.2719	9.3317	118.35	-0.01	7807.2	168.643
1650.0	6546.191	8.0600	7.6371	7.6867	118.80	-0.01	7807.4	168.405
1700.0	6546.122	10.8612	5.9812	6.0202	119.16	-0.01	7807.6	168.189
1750.0	6546.043	13.6442	4.3089	4.3371	119.43	-0.01	7807.9	167.998
1800.0	6545.955	16.4141	2.6249	2.6421	119.61	-0.01	7808.1	167.834
1850.0	6545.860	19.1761	0.9337	0.9398	119.70	-0.01	7808.3	167.700
1900.0	6545.757	21.9354	-0.7601	-0.7651	119.71	-0.02	7808.4	167.595
1950.0	6545.647	24.6971	-2.4519	-2.4680	119.62	-0.02	7808.6	167.520
2000.0	6545.531	27.4664	-4.1372	-4.1643	119.45	-0.02	7808.8	167.477
2050.0	6545.411	30.2485	-5.8113	-5.8492	119.19	-0.02	7808.9	167.465
2100.0	6545.286	33.0485	-7.4696	-7.5181	118.84	-0.02	7809.0	167.483
2150.0	6545.158	35.8714	-9.1074	-9.1661	118.40	-0.02	7809.1	167.531
2200.0	6545.029	38.7222	-10.7198	-10.7885	117.88	-0.02	7809.2	167.606
2250.0	6544.898	41.6055	-12.3020	-12.3803	117.26	-0.02	7809.3	167.708
2300.0	6544.768	44.5261	-13.8491	-13.9365	116.55	-0.02	7809.4	167.833
2350.0	6544.640	47.4881	-15.3558	-15.4518	115.74	-0.02	7809.4	167.980
2400.0	6544.514	50.4957	-16.8169	-16.9211	114.85	-0.02	7809.4	168.146
2450.0	6544.393	53.5526	-18.2272	-18.3389	113.86	-0.02	7809.5	168.328
2500.0	6544.277	56.6619	-19.5812	-19.6999	112.79	-0.02	7809.5	168.523
2550.0	6544.167	59.8262	-20.8734	-20.9985	111.62	-0.02	7809.5	168.728
2600.0	6544.066	63.0476	-22.0981	-22.2291	110.36	-0.01	7809.5	168.939
2650.0	6543.973	66.3274	-23.2499	-23.3861	109.01	-0.01	7809.4	169.153

TABLE B-IV. GEOGRAPHIC POLAR COORDINATES - PARKING ORBIT PHASE (CONT.)

TIME SEC	GC DIST KM	LONG DEG E	GC LAT DEG N	GD LAT DEG N	HEAD DEG	FLT-PATH DEG	SF VEL M/S	ALTITUDE KM
2700.0	6543.890	69.6660	-24.3231	-24.4641	107.57	-0.01	7809.4	169.367
2750.0	6543.819	73.0628	-25.3124	-25.4576	106.05	-0.01	7809.4	169.577
2800.0	6543.759	76.5164	-26.2123	-26.3612	104.46	-0.01	7809.4	169.782
2850.0	6543.712	80.0241	-27.0179	-27.1699	102.79	-0.01	7809.3	169.976
2900.0	6543.679	83.5821	-27.7243	-27.8790	101.05	-0.00	7809.3	170.159
2950.0	6543.661	87.1857	-28.3273	-28.4841	99.26	-0.00	7809.2	170.328
3000.0	6543.658	90.8289	-28.8229	-28.9814	97.41	0.00	7809.2	170.480
3050.0	6543.670	94.5048	-29.2079	-29.3678	95.52	0.00	7809.1	170.615
3100.0	6543.697	98.2057	-29.4797	-29.6405	93.60	0.01	7809.1	170.729
3150.0	6543.741	101.9231	-29.6364	-29.7978	91.66	0.01	7809.0	170.824
3200.0	6543.802	105.6481	-29.6770	-29.8385	89.70	0.01	7809.0	170.897
3250.0	6543.878	109.3717	-29.6012	-29.7624	87.75	0.01	7808.9	170.949
3300.0	6543.971	113.0848	-29.4094	-29.5700	85.82	0.01	7808.9	170.980
3350.0	6544.079	116.7787	-29.1031	-29.2626	83.91	0.02	7808.9	170.991
3400.0	6544.203	120.4450	-28.6843	-28.8424	82.03	0.02	7808.8	170.983
3450.0	6544.343	124.0763	-28.1559	-28.3121	80.20	0.02	7808.8	170.956
3500.0	6544.496	127.6661	-27.5213	-27.6752	78.42	0.02	7808.7	170.914
3550.0	6544.663	131.2086	-26.7846	-26.9356	76.70	0.03	7808.7	170.857
3600.0	6544.843	134.6993	-25.9502	-26.0979	75.05	0.03	7808.6	170.788
3650.0	6545.036	138.1350	-25.0230	-25.1669	73.48	0.03	7808.6	170.711
3700.0	6545.239	141.5133	-24.0081	-24.1477	71.99	0.03	7808.5	170.627
3750.0	6545.452	144.8330	-22.9110	-23.0457	70.58	0.03	7808.5	170.541
3800.0	6545.675	148.0939	-21.7371	-21.8663	69.26	0.03	7808.4	170.454
3850.0	6545.905	151.2966	-20.4920	-20.6152	68.02	0.03	7808.4	170.371
3900.0	6546.142	154.4428	-19.1812	-19.2978	66.88	0.04	7808.3	170.295
3950.0	6546.385	157.5346	-17.8104	-17.9198	65.83	0.04	7808.2	170.228
4000.0	6546.631	160.5748	-16.3850	-16.4867	64.87	0.04	7808.1	170.175
4050.0	6546.881	163.5667	-14.9104	-15.0039	64.01	0.04	7808.0	170.138
4100.0	6547.133	166.5143	-13.3919	-13.4766	63.23	0.04	7807.9	170.120
4150.0	6547.386	169.4216	-11.8348	-11.9102	62.55	0.04	7807.7	170.123
4200.0	6547.638	172.2929	-10.2440	-10.3098	61.96	0.04	7807.6	170.151
4250.0	6547.888	175.1330	-8.6245	-8.6802	61.46	0.04	7807.4	170.205
4300.0	6548.136	177.9467	-6.9812	-7.0266	61.04	0.04	7807.2	170.288
4350.0	6548.381	-179.2611	-5.3189	-5.3536	60.72	0.04	7807.0	170.399
4400.0	6548.620	-176.4854	-3.6422	-3.6660	60.49	0.03	7806.8	170.541
4450.0	6548.855	-173.7210	-1.9557	-1.9685	60.34	0.03	7806.6	170.714
4500.0	6549.083	-170.9627	-0.2641	-0.2658	60.28	0.03	7806.4	170.918
4550.0	6549.305	-168.2055	1.4281	1.4375	60.32	0.03	7806.1	171.152
4600.0	6549.519	-165.4441	3.1163	3.1367	60.43	0.03	7805.9	171.417
4650.0	6549.725	-162.6734	4.7961	4.8274	60.64	0.03	7805.6	171.710
4700.0	6549.923	-159.8882	6.4627	6.5047	60.93	0.03	7805.3	172.029
4750.0	6550.112	-157.0835	8.1115	8.1640	61.32	0.03	7805.0	172.374
4800.0	6550.292	-154.2543	9.7379	9.8005	61.79	0.03	7804.7	172.741

TABLE B-IV. GEOGRAPHIC POLAR COORDINATES - PARKING ORBIT PHASE (CONT.)

TIME SEC	GC DIST KM	LONG DEG E	GC LAT DEG N	GD LAT DEG N	HEAD DEG	FLT-PATH DEG	SF VEL M/S	ALTITUDE KM
4850.0	6550.463	-151.3958	11.3369	11.4093	62.35	0.02	7804.4	173.127
4900.0	6550.625	-148.5032	12.9038	12.9855	63.01	0.02	7804.1	173.530
4950.0	6550.777	-145.5722	14.4334	14.5241	63.75	0.02	7803.8	173.946
5000.0	6550.920	-142.5984	15.9207	16.0198	64.59	0.02	7803.5	174.370
5050.0	6551.053	-139.5781	17.3606	17.4675	65.51	0.02	7803.2	174.800
5100.0	6551.178	-136.5078	18.7475	18.8618	66.53	0.02	7802.9	175.231
5150.0	6551.293	-133.3844	20.0762	20.1972	67.65	0.02	7802.6	175.658
5200.0	6551.400	-130.2055	21.3411	21.4683	68.85	0.02	7802.3	176.079
5250.0	6551.499	-126.9694	22.5367	22.6696	70.14	0.01	7802.1	176.488
5300.0	6551.590	-123.6752	23.6575	23.7954	71.52	0.01	7801.8	176.881
5350.0	6551.672	-120.3227	24.6980	24.8405	72.98	0.01	7801.6	177.255
5400.0	6551.747	-116.9128	25.6529	25.7993	74.52	0.01	7801.3	177.605
5450.0	6551.815	-113.4474	26.5170	26.6668	76.14	0.01	7801.1	177.929
5500.0	6551.877	-109.9295	27.2852	27.4380	77.83	0.01	7801.0	178.222
5550.0	6551.931	-106.3632	27.9532	28.1085	79.59	0.01	7800.8	178.482
5600.0	6551.979	-102.7537	28.5167	28.6740	81.40	0.01	7800.7	178.706
5650.0	6552.022	-99.1071	28.9722	29.1311	83.26	0.01	7800.6	178.892
5700.0	6552.058	-95.4307	29.3166	29.4766	85.16	0.00	7800.5	179.038
5750.0	6552.089	-91.7324	29.5475	29.7084	87.08	0.00	7800.4	179.142
5800.0	6552.114	-88.0207	29.6635	29.8247	89.02	0.00	7800.4	179.205
5850.0	6552.134	-84.3045	29.6637	29.8249	90.97	0.00	7800.4	179.225
5900.0	6552.148	-80.5927	29.5481	29.7089	92.91	0.00	7800.4	179.202
5950.0	6552.157	-76.8944	29.3175	29.4775	94.84	0.00	7800.5	179.137
6000.0	6552.161	-73.2180	28.9735	29.1323	96.74	0.00	7800.5	179.031
6050.0	6552.159	-69.5715	28.5184	28.6757	98.59	-0.00	7800.7	178.886
6100.0	6552.152	-65.9619	27.9552	28.1105	100.41	-0.00	7800.8	178.703
6150.0	6552.139	-62.3956	27.2876	27.4404	102.16	-0.00	7800.9	178.485
6200.0	6552.120	-58.8777	26.5197	26.6695	103.85	-0.00	7801.1	178.234
6250.0	6552.095	-55.4124	25.6560	25.8024	105.47	-0.00	7801.3	177.954
6300.0	6552.064	-52.0025	24.7015	24.8439	107.02	-0.00	7801.5	177.648
6350.0	6552.027	-48.6501	23.6613	23.7992	108.48	-0.01	7801.8	177.320
6400.0	6551.983	-45.3559	22.5409	22.6737	109.86	-0.01	7802.0	176.973
6450.0	6551.933	-42.1199	21.3456	21.4729	111.15	-0.01	7802.3	176.612
6500.0	6551.875	-38.9411	20.0811	20.2021	112.35	-0.01	7802.5	176.241
6550.0	6551.810	-35.8179	18.7528	18.8671	113.46	-0.01	7802.8	175.864
6600.0	6551.738	-32.7477	17.3662	17.4732	114.48	-0.01	7803.1	175.486
6650.0	6551.659	-29.7276	15.9268	16.0259	115.41	-0.01	7803.4	175.110
6700.0	6551.572	-26.7541	14.4398	14.5305	116.25	-0.01	7803.7	174.741
6750.0	6551.477	-23.8233	12.9106	12.9924	116.99	-0.01	7803.9	174.383
6800.0	6551.375	-20.9311	11.3441	11.4166	117.64	-0.02	7804.2	174.040
6850.0	6551.265	-18.0730	9.7455	9.8082	118.21	-0.02	7804.5	173.715
6900.0	6551.149	-15.2442	8.1196	8.1721	118.68	-0.02	7804.8	173.411
6950.0	6551.025	-12.4400	6.4712	6.5133	119.06	-0.02	7805.0	173.132

TABLE B-IV. GEOGRAPHIC POLAR COORDINATES - PARKING ORBIT PHASE (CONT.)

TIME SEC	GC DIST KM	LONG DEG E	GC LAT DEG N	GD LAT DEG N	HEAD DEG	FLT-PATH DEG	SF VEL M/S	ALTITUDE KM
7000.0	6550.895	-9.6554	4.8050	4.8364	119.36	-0.02	7805.3	172.879
7050.0	6550.758	-6.8852	3.1257	3.1462	119.57	-0.02	7805.5	172.656
7100.0	6550.615	-4.1245	1.4379	1.4473	119.68	-0.02	7805.7	172.463
7150.0	6550.468	-1.3681	-0.2538	-0.2555	119.72	-0.02	7805.9	172.302
7200.0	6550.315	1.3893	-1.9450	-1.9578	119.66	-0.02	7806.1	172.174
7250.0	6550.159	4.1528	-3.6310	-3.6548	119.51	-0.02	7806.3	172.079
7300.0	6549.999	6.9275	-5.3073	-5.3419	119.28	-0.02	7806.5	172.017
7350.0	6549.837	9.7186	-6.9692	-7.0145	118.96	-0.02	7806.6	171.988
7400.0	6549.674	12.5310	-8.6121	-8.6677	118.55	-0.02	7806.7	171.990
7450.0	6549.511	15.3698	-10.2311	-10.2968	118.05	-0.02	7806.8	172.023
7500.0	6549.348	18.2396	-11.8216	-11.8969	117.46	-0.02	7806.9	172.084
7550.0	6549.187	21.1453	-13.3784	-13.4630	116.77	-0.02	7807.0	172.171
7600.0	6549.028	24.0911	-14.8966	-14.9900	116.00	-0.02	7807.1	172.282
7650.0	6548.874	27.0812	-16.3710	-16.4726	115.14	-0.02	7807.1	172.415
7700.0	6548.725	30.1193	-17.7962	-17.9055	114.18	-0.02	7807.2	172.565
7750.0	6548.582	33.2089	-19.1669	-19.2834	113.13	-0.02	7807.2	172.732
7800.0	6548.447	36.3527	-20.4777	-20.6008	111.99	-0.02	7807.2	172.910
7850.0	6548.321	39.5529	-21.7229	-21.8520	110.76	-0.02	7807.2	173.097
7900.0	6548.204	42.8111	-22.8970	-23.0316	109.44	-0.02	7807.2	173.289
7950.0	6548.099	46.1279	-23.9945	-24.1340	108.03	-0.01	7807.2	173.483
8000.0	6548.005	49.5032	-25.0099	-25.1537	106.54	-0.01	7807.1	173.677
8050.0	6547.924	52.9357	-25.9377	-26.0853	104.97	-0.01	7807.1	173.866
8100.0	6547.858	56.4232	-26.7729	-26.9239	103.33	-0.01	7807.1	174.048
8150.0	6547.805	59.9623	-27.5107	-27.6644	101.61	-0.01	7807.0	174.220
8200.0	6547.769	63.5485	-28.1465	-28.3025	99.83	-0.00	7807.0	174.379
8250.0	6547.748	67.1763	-28.6763	-28.8342	98.00	-0.00	7807.0	174.525
8300.0	6547.744	70.8390	-29.0967	-29.2561	96.13	0.00	7806.9	174.653
8350.0	6547.757	74.5292	-29.4048	-29.5653	94.22	0.00	7806.9	174.765
8400.0	6547.787	78.2387	-29.5986	-29.7597	92.28	0.01	7806.8	174.857
8450.0	6547.834	81.9587	-29.6767	-29.8381	90.34	0.01	7806.8	174.929
8500.0	6547.899	85.6802	-29.6386	-29.7999	88.39	0.01	7806.7	174.982
8550.0	6547.981	89.3941	-29.4845	-29.6453	86.45	0.01	7806.7	175.014
8600.0	6548.079	93.0917	-29.2156	-29.3754	84.53	0.02	7806.6	175.027
8650.0	6548.195	96.7643	-28.8336	-28.9921	82.64	0.02	7806.6	175.021
8700.0	6548.327	100.4044	-28.3413	-28.4980	80.79	0.02	7806.5	174.998
8750.0	6548.473	104.0050	-27.7417	-27.8963	79.00	0.02	7806.5	174.959
8800.0	6548.635	107.5602	-27.0388	-27.1907	77.26	0.02	7806.4	174.905
8850.0	6548.810	111.0651	-26.2369	-26.3857	75.59	0.03	7806.3	174.840
8900.0	6548.998	114.5160	-25.3407	-25.4858	73.99	0.03	7806.3	174.765
8950.0	6549.197	117.9103	-24.3552	-24.4962	72.47	0.03	7806.2	174.682
9000.0	6549.406	121.2463	-23.2859	-23.4222	71.04	0.03	7806.1	174.596
9050.0	6549.624	124.5236	-22.1381	-22.2691	69.69	0.03	7806.0	174.508
9100.0	6549.849	127.7425	-20.9173	-21.0425	68.43	0.03	7805.9	174.421

TABLE B-IV. GEOGRAPHIC POLAR COORDINATES - PARKING ORBIT PHASE (CONT.)

TIME SEC	GC DIST KM	LONG DEG E	GC LAT DEG N	GD LAT DEG N	HEAD DEG	FLT-PATH DEG	SF VEL M/S	ALTITUDE KM
9150.0	6550.081	130.9044	-19.6292	-19.7480	67.26	0.03	7805.8	174.338
9200.0	6550.316	134.0111	-18.2792	-18.3911	66.17	0.03	7805.7	174.263
9250.0	6550.554	137.0653	-16.8730	-16.9773	65.19	0.04	7805.6	174.198
9300.0	6550.793	140.0702	-15.4158	-15.5121	64.29	0.04	7805.5	174.145
9350.0	6551.031	143.0294	-13.9131	-14.0007	63.49	0.03	7805.3	174.107
9400.0	6551.266	145.9470	-12.3699	-12.4486	62.77	0.03	7805.2	174.086
9450.0	6551.497	148.8272	-10.7915	-10.8606	62.15	0.03	7805.0	174.085
9500.0	6551.723	151.6746	-9.1828	-9.2420	61.62	0.03	7804.9	174.104
9550.0	6551.940	154.4940	-7.5487	-7.5976	61.18	0.03	7804.7	174.145
9600.0	6552.149	157.2903	-5.8939	-5.9323	60.82	0.03	7804.5	174.209
9624.800	BEGIN S-IVB RESTART PREPARATIONS	-- START OF TIME BASE 6						
	6552.224	158.6702	-5.0669	-5.1000	60.68	0.03	7804.4	174.226

TABLE B-V. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS - SECONDBURN AND TRANSLUNAR PHASES

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S	DOXE M/S SQ	DDYE M/S SQ	DDZE M/S SQ
9624.800	-9577878	-2055854	-5336199	6445.5	-1415.1	-3333.3	4.08	2.50	6.84
	BEGIN S-IVB RESTART PREPARATIONS		-- START OF TIME BASE 6						
9630.0	-9544318	-2063186	-5353460	6466.7	-1402.0	-3297.7	4.04	2.51	6.86
9640.0	-9479450	-2077080	-5386093	6506.7	-1376.8	-3228.9	3.96	2.54	6.90
9650.0	-9414187	-2090721	-5418037	6545.8	-1351.3	-3159.8	3.87	2.56	6.93
9660.0	-9348537	-2104105	-5449288	6584.1	-1325.5	-3090.3	3.79	2.58	6.97
9670.0	-9282507	-2117231	-5479841	6621.6	-1299.6	-3020.4	3.71	2.61	7.01
9680.0	-9216107	-2130095	-5509694	6658.2	-1273.4	-2950.1	3.62	2.63	7.04
9690.0	-9149345	-2142697	-5538843	6694.0	-1247.0	-2879.5	3.54	2.65	7.08
9700.0	-9082229	-2155034	-5567283	6729.0	-1220.3	-2808.6	3.45	2.67	7.11
9710.0	-9014768	-2167103	-5595013	6763.0	-1193.5	-2737.3	3.36	2.70	7.14
9720.0	-8946971	-2178903	-5622028	6796.3	-1166.4	-2665.7	3.28	2.72	7.18
9730.0	-8878846	-2190431	-5648326	6828.6	-1139.1	-2593.8	3.19	2.74	7.21
9740.0	-8810402	-2201685	-5673903	6860.1	-1111.6	-2521.5	3.10	2.76	7.24
9750.0	-8741648	-2212663	-5698756	6890.7	-1084.0	-2449.0	3.02	2.78	7.27
9760.0	-8672592	-2223363	-5722882	6920.4	-1056.1	-2376.2	2.93	2.80	7.29
9770.0	-8603243	-2233783	-5746279	6949.2	-999.7	-2303.1	2.84	2.82	7.32
9780.0	-8533610	-2243922	-5768944	6977.2	-971.2	-2229.8	2.75	2.84	7.35
9790.0	-8463702	-2253777	-5790874	7004.2	-942.6	-2156.2	2.66	2.86	7.37
9800.0	-8393528	-2263346	-5812067	7030.4	-913.7	-2082.3	2.57	2.87	7.40
9810.0	-8323097	-2272627	-5832520	7055.7	-884.7	-2008.2	2.48	2.89	7.42
9820.0	-8252417	-2281620	-5852230	7080.1	-855.5	-1933.9	2.39	2.91	7.44
9830.0	-8181499	-2290321	-5871197	7103.5	-826.2	-1859.3	2.30	2.93	7.47
9840.0	-8110350	-2298730	-5889416	7126.1	-796.7	-1784.6	2.21	2.94	7.49
9850.0	-8038979	-2306844	-5906887	7147.8	-767.0	-1709.6	2.12	2.96	7.51
9860.0	-7967397	-2314663	-5923608	7168.5	-737.1	-1634.4	2.03	2.98	7.52
9870.0	-7895612	-2322183	-5939576	7188.3	-707.1	-1559.1	1.94	2.99	7.54
9880.0	-7823633	-2329404	-5954789	7207.3	-677.0	-1483.6	1.85	3.01	7.56
9890.0	-7751470	-2336325	-5969247	7225.3	-646.7	-1407.9	1.75	3.02	7.58
9900.0	-7679131	-2342943	-5982947	7242.3	-616.2	-1332.1	1.66	3.04	7.59
9910.0	-7606626	-2349257	-5995888	7258.5	-585.6	-1256.1	1.57	3.05	7.60
9920.0	-7533964	-2355267	-6008069	7273.7	-554.9	-1180.0	1.48	3.07	7.62
9930.0	-7461155	-2360969	-6019488	7288.0	-524.1	-1103.8	1.38	3.08	7.63
9940.0	-7388207	-2366364	-6030144	7301.4	-493.1	-1027.4	1.29	3.09	7.64
9950.0	-7315129	-2371450	-6040036	7313.9	-462.0	-951.0	1.20	3.10	7.65
9960.0	-7241933	-2376226	-6049163	7325.4	-430.8	-874.4	1.10	3.12	7.66
9970.0	-7168625	-2380689	-6057525	7335.9	-399.4	-797.8	1.01	3.13	7.67
9980.0	-7095217	-2384840	-6065119	7345.6	-368.0	-721.1	0.92	3.14	7.67
9990.0	-7021717	-2388678	-6071946	7354.3	-336.4	-644.3	0.82	3.15	7.68
10000.0	-6948134	-2392200	-6078006	7362.1	-306.0	-567.5	0.73	3.16	7.69
10010.0	-6874889	-2395416	-6082882	7368.9		-494.2	0.64	3.17	



TABLE B-V. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS - SECOND BURN AND TRANSLUNAR PHASES (CONT.)

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S	DDXE M/S SQ	DDYE M/S SQ	DDZE M/S SQ
10020.0	-6801170	-2398317	-6087439	7374.8	-274.2	-417.3	0.54	3.18	7.69
10030.0	-6727396	-2400900	-6091227	7379.7	-242.4	-340.3	0.45	3.19	7.70
10040.0	-6653579	-2403164	-6094245	7383.7	-210.4	-263.4	0.35	3.20	7.70
10050.0	-6579725	-2405108	-6096494	7386.8	-178.4	-186.4	0.26	3.21	7.70
10060.0	-6505846	-2406732	-6097973	7388.9	-146.3	-109.4	0.17	3.22	7.70
10070.0	-6431950	-2408034	-6098683	7390.4	-114.1	-82.4	0.07	3.22	7.69
10080.0	-6358047	-2409015	-6098623	7390.4	-81.9	-44.5	-0.02	3.23	7.69
10090.0	-6284146	-2409672	-6097794	7389.7	-49.6	121.4	-0.12	3.23	7.69
10100.0	-6210257	-2410006	-6096196	7388.0	-17.2	198.2	-0.21	3.24	7.68
10110.0	-6136388	-2410016	-6093830	7385.5	15.2	275.0	-0.31	3.25	7.68
10120.0	-6062551	-2409701	-6090696	7381.9	47.7	351.8	-0.40	3.25	7.67
10130.0	-5988753	-2409062	-6086795	7377.5	80.3	428.4	-0.49	3.26	7.66
10140.0	-5915003	-2408096	-6082127	7372.1	112.8	505.0	-0.58	3.26	7.66
10150.0	-5841313	-2406805	-6076694	7365.9	145.5	581.5	-0.68	3.26	7.64
10160.0	-5767689	-2405187	-6070497	7358.6	178.1	658.0	-0.77	3.27	7.63
10170.0	-5694143	-2403242	-6063536	7350.4	210.8	734.2	-0.87	3.27	7.63
10180.0	-5620684	-2400970	-6055813	7341.3	243.5	810.4	-0.95	3.27	7.60
10190.0	-5547320	-2398371	-6047328	7331.3	276.3	886.5	-1.05	3.28	7.60
10200.0	-5474061	-2395445	-6038084	7320.3	309.0	962.3	-1.14	3.27	7.57
10202.900	-5452837	-2394535	-6035261	7317.0	318.5	984.3	-1.16	3.27	7.57
10204.0	-5444788	-2394182	-6034174	7316.8	322.2	992.9	0.80	3.52	8.11
10206.0	-5430151	-2393531	-6032173	7323.2	329.3	1009.2	4.20	3.53	8.18
10208.0	-5415494	-2392866	-6030138	7331.8	336.4	1025.6	4.33	3.55	8.21
10210.0	-5400824	-2392186	-6028071	7340.4	343.5	1042.0	4.33	3.56	8.26
10212.0	-5386135	-2391492	-6025970	7349.1	350.6	1058.6	4.33	3.57	8.31
10214.0	-5371429	-2390783	-6023836	7357.7	357.8	1075.3	4.32	3.61	8.40
10216.0	-5356705	-2390061	-6021668	7366.4	365.1	1092.3	4.32	3.69	8.61
10218.0	-5341964	-2389323	-6019466	7375.0	372.5	1109.7	4.31	3.77	8.80
10220.0	-5327206	-2388570	-6017229	7383.6	380.1	1127.4	4.31	3.80	8.87
10222.0	-5312430	-2387802	-6014956	7392.1	387.7	1145.2	4.32	3.79	8.84
10224.0	-5297637	-2387019	-6012648	7400.8	395.3	1162.9	4.32	3.80	8.81
10226.0	-5282827	-2386221	-6010305	7409.4	402.9	1180.5	4.31	3.82	8.82
10228.0	-5267999	-2385407	-6007926	7418.0	410.6	1198.2	4.31	3.84	8.85
10230.0	-5253155	-2384578	-6005512	7426.6	418.3	1215.9	4.30	3.86	8.86
10232.0	-5238293	-2383734	-6003063	7435.3	426.1	1233.6	4.31	3.87	8.86
10234.0	-5223414	-2382874	-6000578	7443.9	433.8	1251.3	4.30	3.87	8.85
10236.0	-5208517	-2381999	-5998057	7452.5	441.6	1269.0	4.30	3.88	8.85
10238.0	-5193604	-2381108	-5995502	7461.1	449.3	1286.7	4.29	3.90	8.86
10240.0	-5178673	-2380202	-5992911	7469.6	457.1	1304.4	4.28	3.91	8.88
10242.0	-5163725	-2379279	-5990284	7478.2	465.0	1322.2	4.28	3.92	8.90

TABLE B-V. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS - SECOND BURN AND TRANSLUNAR PHASES (CONT.)

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	OZE M/S	DOXE M/S SQ	DOYE M/S SQ	DOZE M/S SQ
10244.0	-5148760	-2378342	-5987622	7486.7	472.8	1340.0	4.28	3.93	8.91
10246.0	-5133778	-2377388	-5984924	7495.3	480.7	1357.8	4.28	3.94	8.91
10248.0	-5118779	-2376419	-5982190	7503.8	488.6	1375.7	4.27	3.95	8.91
10250.0	-5103763	-2375434	-5979421	7512.4	496.5	1393.5	4.26	3.96	8.91
10252.0	-5088730	-2374433	-5976617	7520.9	504.4	1411.3	4.26	3.97	8.91
10254.0	-5073679	-2373416	-5973776	7529.4	512.3	1429.1	4.26	3.97	8.91
10256.0	-5058612	-2372384	-5970900	7537.9	520.3	1446.9	4.25	3.98	8.91
10258.0	-5043528	-2371335	-5967988	7546.4	528.2	1464.8	4.25	3.99	8.91
10260.0	-5028426	-2370271	-5965040	7555.1	536.2	1482.7	4.25	4.07	9.15
10262.0	-5013305	-2369190	-5962057	7565.2	544.4	1501.0	5.06	4.08	9.16
10264.0	-4998165	-2368093	-5959036	7575.3	552.6	1519.3	5.07	4.09	9.17
10266.0	-4983004	-2366980	-5955979	7585.4	560.8	1537.7	5.08	4.10	9.18
10268.0	-4967823	-2365850	-5952885	7595.6	569.0	1556.1	5.08	4.11	9.19
10270.0	-4952622	-2364704	-5949754	7605.7	577.2	1574.5	5.09	4.12	9.20
10272.0	-4937400	-2363541	-5946587	7615.9	585.5	1592.9	5.09	4.13	9.21
10274.0	-4922158	-2362362	-5943382	7626.1	593.7	1611.4	5.10	4.14	9.22
10276.0	-4906895	-2361166	-5940141	7636.3	602.0	1629.8	5.10	4.14	9.23
10278.0	-4891613	-2359954	-5936863	7646.5	610.3	1648.3	5.10	4.14	9.23
10280.0	-4876309	-2358725	-5933548	7656.7	618.6	1666.8	5.10	4.15	9.23
10282.0	-4860986	-2357480	-5930196	7666.9	626.9	1685.2	5.10	4.16	9.24
10284.0	-4845642	-2356218	-5926807	7677.1	635.2	1703.7	5.10	4.17	9.24
10286.0	-4830277	-2354939	-5923381	7687.3	643.6	1722.2	5.11	4.17	9.25
10288.0	-4814893	-2353643	-5919918	7697.5	651.9	1740.7	5.12	4.18	9.26
10290.0	-4799487	-2352331	-5916418	7707.8	660.3	1759.2	5.12	4.19	9.27
10292.0	-4784062	-2351002	-5912882	7718.0	668.7	1777.8	5.11	4.19	9.27
10294.0	-4768615	-2349656	-5909307	7728.2	677.1	1796.3	5.12	4.19	9.26
10296.0	-4753149	-2348294	-5905696	7738.5	685.5	1814.8	5.13	4.19	9.25
10298.0	-4737661	-2346914	-5902048	7748.7	693.9	1833.3	5.14	4.19	9.25
10300.0	-4722154	-2345518	-5898363	7759.0	702.3	1851.8	5.14	4.20	9.25
10302.0	-4706625	-2344105	-5894641	7769.3	710.7	1870.3	5.14	4.21	9.26
10304.0	-4691076	-2342676	-5890882	7779.6	719.1	1888.8	5.14	4.22	9.28
10306.0	-4675507	-2341229	-5887086	7789.9	727.5	1907.4	5.15	4.22	9.29
10308.0	-4659917	-2339765	-5883252	7800.2	736.0	1926.0	5.15	4.23	9.30
10310.0	-4644306	-2338285	-5879382	7810.5	744.5	1944.6	5.15	4.24	9.31
10312.0	-4628675	-2336788	-5875474	7820.8	752.9	1963.2	5.15	4.25	9.32
10314.0	-4613023	-2335273	-5871529	7831.1	761.4	1981.9	5.16	4.25	9.33
10316.0	-4597351	-2333742	-5867546	7841.4	770.0	2000.5	5.17	4.25	9.33
10318.0	-4581658	-2332193	-5863527	7851.7	778.5	2019.2	5.17	4.25	9.34
10320.0	-4565944	-2330628	-5859469	7862.1	787.0	2037.9	5.17	4.26	9.35
10322.0	-4550209	-2329045	-5855375	7872.4	795.5	2056.6	5.18	4.27	9.35
10324.0	-4534454	-2327446	-5851243	7882.8	804.1	2075.3	5.19	4.28	9.36
10326.0	-4518678	-2325829	-5847074	7893.2	812.6	2094.1	5.20	4.29	9.37
10328.0	-4502881	-2324195	-5842867	7903.6	821.2	2112.8	5.20	4.30	9.38

TABLE B-V. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS - SECOND BURN AND TRANSLUNAR PHASES (CONT.)

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S	DDXE M/S SQ	DDYE M/S SQ	DDZE M/S SQ
10330.0	-4487064	-2322544	-5838622	7914.0	829.8	2131.6	5.21	4.30	9.39
10332.0	-4471225	-2320876	-5834340	7924.4	838.4	2150.4	5.22	4.31	9.40
10334.0	-4455366	-2319190	-5830021	7934.9	847.1	2169.2	5.22	4.32	9.41
10336.0	-4439486	-2317488	-5825664	7945.3	855.7	2188.0	5.22	4.32	9.41
10338.0	-4423585	-2315768	-5821269	7955.8	864.3	2206.8	5.23	4.33	9.42
10340.0	-4407663	-2314030	-5816837	7966.2	873.0	2225.6	5.24	4.34	9.43
10342.0	-4391720	-2312276	-5812366	7976.7	881.7	2244.5	5.24	4.35	9.44
10344.0	-4375756	-2310504	-5807859	7987.2	890.4	2263.4	5.25	4.35	9.45
10346.0	-4359771	-2308714	-5803313	7997.7	899.1	2282.3	5.26	4.35	9.45
10348.0	-4343765	-2306907	-5798729	8008.3	907.8	2301.2	5.27	4.36	9.47
10350.0	-4327738	-2305083	-5794108	8018.8	916.5	2320.2	5.27	4.37	9.47
10352.0	-4311690	-2303241	-5789449	8029.4	925.3	2339.1	5.28	4.37	9.48
10354.0	-4295620	-2301382	-5784751	8039.9	934.0	2358.1	5.29	4.38	9.48
10356.0	-4279530	-2299505	-5780016	8050.5	942.8	2377.1	5.30	4.39	9.49
10358.0	-4263418	-2297611	-5775243	8061.1	951.6	2396.1	5.31	4.40	9.51
10360.0	-4247285	-2295699	-5770432	8071.8	960.4	2415.1	5.32	4.41	9.52
10362.0	-4231131	-2293769	-5765583	8082.4	969.2	2434.1	5.32	4.41	9.52
10364.0	-4214956	-2291822	-5760696	8093.1	978.0	2453.2	5.34	4.41	9.53
10366.0	-4198759	-2289857	-5755770	8103.8	986.8	2472.2	5.35	4.42	9.53
10368.0	-4182541	-2287875	-5750807	8114.5	995.7	2491.3	5.36	4.42	9.55
10370.0	-4166301	-2285874	-5745805	8125.2	1004.5	2510.4	5.37	4.44	9.56
10372.0	-4150040	-2283856	-5740765	8136.0	1013.4	2529.5	5.39	4.45	9.57
10374.0	-4133757	-2281821	-5735687	8146.8	1022.3	2548.7	5.40	4.46	9.57
10376.0	-4117453	-2279767	-5730570	8157.6	1031.2	2567.8	5.40	4.46	9.58
10378.0	-4101127	-2277696	-5725415	8168.4	1040.2	2587.0	5.41	4.46	9.59
10380.0	-4084779	-2275606	-5720222	8179.2	1049.1	2606.2	5.42	4.47	9.60
10382.0	-4068410	-2273499	-5714990	8190.0	1058.0	2625.4	5.44	4.47	9.60
10384.0	-4052019	-2271374	-5709720	8200.9	1067.0	2644.6	5.45	4.48	9.61
10386.0	-4035606	-2269231	-5704412	8211.8	1076.0	2663.8	5.46	4.50	9.63
10388.0	-4019172	-2267070	-5699065	8222.8	1085.0	2683.1	5.46	4.51	9.64
10390.0	-4002715	-2264891	-5693680	8233.7	1094.0	2702.4	5.47	4.51	9.65
10392.0	-3986237	-2262694	-5688255	8244.7	1103.0	2721.7	5.49	4.51	9.66
10394.0	-3969736	-2260479	-5682793	8255.7	1112.0	2741.0	5.51	4.51	9.67
10396.0	-3953214	-2258246	-5677291	8266.7	1121.1	2760.4	5.52	4.53	9.68
10398.0	-3936670	-2255995	-5671751	8277.7	1130.2	2779.7	5.53	4.54	9.68
10400.0	-3920103	-2253726	-5666172	8288.8	1139.2	2799.1	5.55	4.55	9.69
10402.0	-3903514	-2251438	-5660555	8299.9	1148.4	2818.5	5.56	4.56	9.70
10404.0	-3886903	-2249132	-5654898	8311.1	1157.5	2837.9	5.58	4.56	9.72
10406.0	-3870270	-2246808	-5649203	8322.2	1166.6	2857.4	5.59	4.57	9.73
10408.0	-3853614	-2244466	-5643469	8333.4	1175.8	2876.8	5.60	4.58	9.74
10410.0	-3836936	-2242105	-5637696	8344.6	1184.9	2896.3	5.62	4.58	9.74
10412.0	-3820236	-2239726	-5631884	8355.9	1194.1	2915.8	5.63	4.59	9.75
10414.0	-3803513	-2237329	-5626033	8367.2	1203.3	2935.3	5.65	4.60	9.77

TABLE B-V. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS - SECOND BURN AND TRANSUNAR PHASES (CONT.)

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S	DDXE M/S SQ	DDYE M/S SQ	DDZE M/S SQ
10416.0	-3786767	-2234913	-5620142	8378.5	1212.5	2954.9	5.67	4.61	9.78
10418.0	-3769999	-2234279	-5614213	8389.9	1221.7	2974.5	5.69	4.62	9.80
10420.0	-3753208	-2230026	-5608244	8401.2	1231.0	2994.0	5.70	4.63	9.80
10422.0	-3736394	-2227555	-5602237	8412.7	1240.2	3013.6	5.71	4.64	9.80
10424.0	-3719557	-2225065	-5596190	8424.1	1249.5	3033.3	5.73	4.64	9.82
10426.0	-3702697	-2222557	-5590104	8435.6	1258.8	3052.9	5.75	4.65	9.85
10428.0	-3685815	-2220030	-5583978	8447.1	1268.1	3072.7	5.77	4.66	9.86
10430.0	-3668909	-2217484	-5577813	8458.7	1277.4	3092.4	5.79	4.67	9.87
10432.0	-3651980	-2214920	-5571609	8470.2	1286.8	3112.1	5.80	4.68	9.87
10434.0	-3635028	-2212337	-5565365	8481.9	1296.2	3131.9	5.82	4.69	9.88
10436.0	-3618052	-2209736	-5559081	8493.5	1305.5	3151.7	5.84	4.70	9.90
10438.0	-3601054	-2207115	-5552758	8505.2	1314.9	3171.5	5.86	4.71	9.92
10440.0	-3584031	-2204476	-5546395	8517.0	1324.4	3191.3	5.88	4.72	9.94
10442.0	-3566986	-2201818	-5539992	8528.8	1333.8	3211.2	5.89	4.73	9.95
10444.0	-3549916	-2199141	-5533550	8540.6	1343.3	3231.1	5.91	4.74	9.96
10446.0	-3532823	-2196444	-5527058	8552.4	1352.8	3251.1	5.93	4.75	9.97
10448.0	-3515707	-2193729	-5520546	8564.3	1362.3	3271.0	5.95	4.76	9.99
10450.0	-3498566	-2190995	-5513984	8576.2	1371.8	3291.0	5.97	4.76	10.00
10452.0	-3481402	-2188242	-5507382	8588.2	1381.3	3311.0	5.99	4.77	10.02
10454.0	-3464214	-2185470	-5500740	8600.2	1390.9	3331.1	6.02	4.78	10.04
10456.0	-3447001	-2182679	-5494057	8612.2	1400.5	3351.2	6.04	4.79	10.06
10458.0	-3429765	-2179868	-5487335	8624.3	1410.1	3371.3	6.06	4.81	10.08
10460.0	-3412504	-2177038	-5480572	8636.5	1419.7	3391.5	6.08	4.82	10.10
10462.0	-3395219	-2174189	-5473769	8648.7	1429.4	3411.7	6.11	4.84	10.12
10464.0	-3377909	-2171321	-5466925	8660.9	1439.1	3432.0	6.14	4.85	10.14
10466.0	-3360575	-2168433	-5460041	8673.2	1448.8	3452.3	6.18	4.87	10.16
10468.0	-3343216	-2165526	-5453116	8685.6	1458.5	3472.6	6.21	4.87	10.18
10470.0	-3325833	-2162599	-5446150	8698.1	1468.3	3493.0	6.24	4.88	10.20
10472.0	-3308424	-2159653	-5439144	8710.6	1478.0	3513.4	6.26	4.89	10.23
10474.0	-3290990	-2156687	-5432097	8723.1	1487.8	3533.9	6.28	4.91	10.24
10476.0	-3273532	-2153701	-5425009	8735.7	1497.7	3554.4	6.30	4.92	10.25
10478.0	-3256048	-2150696	-5417879	8748.3	1507.5	3574.9	6.32	4.93	10.27
10480.0	-3238538	-2147671	-5410709	8761.0	1517.4	3595.5	6.35	4.94	10.30
10482.0	-3221004	-2144627	-5403497	8773.7	1527.3	3616.1	6.37	4.95	10.33
10484.0	-3203444	-2141562	-5396245	8786.5	1537.2	3636.8	6.40	4.96	10.35
10486.0	-3185858	-2138478	-5388950	8799.3	1547.2	3657.5	6.43	4.99	10.38
10488.0	-3168246	-2135373	-5381615	8812.2	1557.2	3678.3	6.46	5.02	10.40
10490.0	-3150609	-2132249	-5374237	8825.1	1567.2	3699.1	6.48	5.04	10.43
10492.0	-3132946	-2129105	-5366818	8838.1	1577.3	3720.0	6.51	5.06	10.45
10494.0	-3115257	-2125940	-5359357	8851.2	1587.4	3740.9	6.55	5.07	10.48
10496.0	-3097541	-2122755	-5351854	8864.3	1597.6	3761.9	6.57	5.08	10.52
10498.0	-3079800	-2119549	-5344310	8877.4	1607.8	3783.0	6.59	5.09	10.55
10500.0	-3062031	-2116324	-5336722	8890.7	1618.0	3804.1	6.62	5.11	10.58

TABLE B-V. EARTH-FIXED LAUNCH-SITE POSITIONS, VELOCITIES, AND ACCELERATIONS - SECOND BURN AND TRANSLUNAR PHASES (CONT.)

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S	ODXE M/S SQ	ODYE M/S SQ	ODZE M/S SQ
10502.0	-3044237	-2113078	-5329093	8903.9	1628.2	3825.3	6.65	5.13	10.62
10504.0	-3026416	-2109811	-5321421	8917.2	1638.5	3846.6	6.66	5.14	10.65
10506.0	-3008568	-2106524	-5313707	8930.6	1648.8	3867.9	6.68	5.16	10.68
10508.0	-2990693	-2103216	-5305950	8944.0	1659.1	3889.3	6.70	5.18	10.71
10510.0	-2972792	-2099887	-5298149	8957.4	1669.5	3910.8	6.73	5.20	10.75
10512.0	-2954864	-2096538	-5290306	8970.9	1679.9	3932.3	6.75	5.22	10.78
10514.0	-2936908	-2093167	-5282420	8984.4	1690.4	3953.9	6.78	5.25	10.83
10516.0	-2918926	-2089776	-5274491	8998.0	1700.9	3975.6	6.82	5.27	10.87
10518.0	-2900916	-2086364	-5266518	9011.7	1711.5	3997.4	6.85	5.29	10.91
10520.0	-2882879	-2082930	-5258501	9025.4	1722.1	4019.2	6.87	5.31	10.95
10522.0	-2864815	-2079475	-5250441	9039.2	1732.7	4041.2	6.90	5.33	10.99
10524.0	-2846723	-2075999	-5242336	9053.0	1743.4	4063.2	6.94	5.35	11.02
10526.0	-2828603	-2072502	-5234188	9066.9	1754.1	4085.3	6.95	5.39	11.10
10528.0	-2810455	-2068983	-5225995	9080.7	1765.0	4107.7	6.91	5.47	11.28
10530.0	-2792280	-2065442	-5217757	9094.5	1776.0	4130.4	6.86	5.55	11.46
10532.0	-2774077	-2061879	-5209473	9108.2	1787.1	4153.4	6.86	5.59	11.56
10534.0	-2755847	-2058293	-5201143	9122.0	1798.3	4176.5	6.91	5.60	11.56
10536.0	-2737589	-2054685	-5192767	9135.9	1809.5	4199.7	6.98	5.60	11.54
10538.0	-2719304	-2051055	-5184345	9149.9	1820.7	4222.7	7.04	5.61	11.55
10540.0	-2700990	-2047403	-5175876	9164.0	1831.9	4245.9	7.10	5.61	11.56
10542.0	-2682647	-2043727	-5167361	9178.3	1843.2	4269.0	7.15	5.61	11.57
10544.0	-2664277	-2040030	-5158800	9192.6	1854.4	4292.1	7.20	5.62	11.58
10546.0	-2645877	-2036310	-5150193	9207.1	1865.7	4315.3	7.26	5.64	11.58
10548.0	-2627448	-2032567	-5141539	9221.6	1876.9	4338.4	7.32	5.65	11.59
10550.0	-2608990	-2028802	-5132839	9236.3	1888.3	4361.6	7.37	5.66	11.60
10552.0	-2590503	-2025014	-5124093	9251.1	1899.6	4384.8	7.43	5.67	11.61
10553.610	-2575598	-2021949	-5117018	9263.1	1908.7	4403.5	7.47	5.67	11.61
10554.0	-2571986	-2021204	-5115300	9264.2	1910.4	4407.1	-1.94	3.30	7.05
10556.0	-2553467	-2017378	-5106475	9255.8	1916.1	4418.5	-4.49	2.78	5.46
10558.0	-2534965	-2013540	-5097627	9246.8	1921.7	4429.4	-4.51	2.77	5.46
10560.0	-2516480	-2009691	-5088758	9237.8	1927.2	4440.3	-4.52	2.77	5.45
10562.0	-2498013	-2005831	-5079866	9228.7	1932.8	4451.1	-4.54	2.76	5.43
10563.610	-2483161	-2002716	-5072693	9221.4	1937.2	4459.8	-4.55	2.76	5.41
10600.0	-2151749	-1929645	-4906122	9050.9	2038.4	4652.4	-4.83	2.62	5.05
10650.0	-1705370	-1824541	-4667411	8801.8	2164.0	4891.5	-5.12	2.41	4.51
10700.0	-1271775	-1713422	-4417423	8540.3	2278.9	5103.4	-5.32	2.19	3.96
10750.0	-851466	-1596835	-4157532	8271.1	2382.7	5287.7	-5.43	1.97	3.41

S-IVB 2ND GUIDANCE CUTOFF

TRANSLUNAR INJECTION (TLI)

TABLE B-V. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS - SECOND BURN AND TRANS-LUNAR PHASES (CONT.)

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S	DDXE M/S SQ	DDYE M/S SQ	DDZE M/S SQ
10800.0	-444725	-1475329	-3889105	7998.3	2475.7	5444.9	-5.47	1.75	2.88
10850.0	-51634	-1349445	-3613472	7725.7	2558.0	5576.2	-5.43	1.54	2.37
10900.0	327899	-1219697	-3331894	7456.5	2630.3	5683.0	-5.33	1.35	1.90
10950.0	694112	-1086572	-3045546	7193.2	2693.2	5767.3	-5.19	1.17	1.47
11000.0	1047355	-950518	-2755507	6937.9	2747.6	5831.1	-5.02	1.01	1.08
11050.0	1388064	-811944	-2462747	6692.1	2794.2	5876.4	-4.82	0.86	0.74
11100.0	1716739	-671216	-2168136	6456.7	2833.8	5905.5	-4.60	0.73	0.43
11150.0	2033919	-528663	-1872439	6232.4	2867.3	5920.2	-4.37	0.61	0.16
11200.0	2340166	-384572	-1576326	6019.4	2895.4	5922.4	-4.14	0.51	-0.07
11250.0	2636055	-239199	-1280381	5818.0	2918.8	5913.8	-3.91	0.42	-0.27
11300.0	2922155	-92764	-985106	5627.9	2938.0	5895.8	-3.69	0.35	-0.44
11350.0	3199028	54540	-690930	5448.9	2953.6	5870.0	-3.47	0.28	-0.59
11400.0	3467220	202548	-398221	5280.6	2966.2	5837.4	-3.26	0.22	-0.71
11450.0	3727256	351115	-107287	5122.5	2976.1	5799.1	-3.06	0.18	-0.82
11500.0	3979637	500122	181611	4974.3	2983.8	5756.1	-2.87	0.13	-0.90
11550.0	4224840	649461	468253	4835.4	2989.5	5709.0	-2.69	0.10	-0.97
11600.0	4463321	799041	752461	4705.3	2993.5	5658.8	-2.52	0.07	-1.03
11650.0	4695508	948787	1034087	4583.5	2996.1	5605.9	-2.36	0.04	-1.08
11700.0	4921801	1098635	1313011	4469.5	2997.6	5550.8	-2.21	0.02	-1.12
11750.0	5142580	1248533	1589136	4362.8	2998.1	5494.0	-2.06	0.00	-1.15
11800.0	5358197	1398435	1862386	4263.0	2997.8	5435.8	-1.93	-0.01	-1.17
11850.0	5568987	1548301	2132702	4169.6	2996.7	5376.7	-1.81	-0.03	-1.19
11900.0	5775259	1698100	2400040	4082.2	2995.1	5316.7	-1.69	-0.04	-1.20
11950.0	5977305	1847804	2664368	4000.5	2993.0	5256.3	-1.58	-0.05	-1.21
12000.0	6175397	1997393	2925665	3924.0	2990.5	5195.5	-1.48	-0.05	-1.22
12050.0	6369788	2146850	3183920	3852.4	2987.7	5134.6	-1.38	-0.06	-1.22
12100.0	6560716	2296162	3439127	3785.4	2984.7	5073.7	-1.30	-0.06	-1.22
CSM SEPARATION									
12147.200	6737962	2436969	3677236	3726.1	2981.7	5016.2	-1.22	-0.07	-1.22

TABLE B-VI. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS - SECOND BURN AND TRANSLUNAR PHASES

TIME SEC	XS KM	YS KM	ZS KM	DXS M/S	DYS M/S	DZS M/S	DDXS M/S SQ	DDYS M/S SQ	DDZS M/S SQ
BEGIN S-IVB RESTART PREPARATIONS -- START OF TIME BASE 6									
9624.800	674.341	-96.242	-6516.720	7763.3	36.6	798.8	-0.96	0.13	9.25
9630.0	714.700	-96.050	-6512.465	7758.2	37.3	846.9	-1.02	0.13	9.24
9640.0	792.230	-95.670	-6503.535	7747.6	38.6	939.2	-1.13	0.13	9.23
9650.0	869.648	-95.277	-6493.681	7735.8	40.0	1031.5	-1.24	0.13	9.22
9660.0	946.943	-94.870	-6482.906	7722.9	41.3	1123.5	-1.35	0.13	9.20
9670.0	1024.103	-94.450	-6471.211	7709.0	42.6	1215.5	-1.46	0.13	9.18
9680.0	1101.118	-94.017	-6458.597	7693.9	44.0	1307.2	-1.56	0.13	9.17
9690.0	1177.977	-93.571	-6445.067	7677.7	45.3	1398.8	-1.67	0.13	9.15
9700.0	1254.669	-93.111	-6430.622	7660.5	46.6	1490.1	-1.78	0.13	9.13
9710.0	1331.183	-92.639	-6415.265	7642.1	47.9	1581.3	-1.89	0.13	9.10
9720.0	1407.508	-92.153	-6398.998	7622.7	49.2	1672.2	-2.00	0.13	9.08
9730.0	1483.634	-91.655	-6381.822	7602.2	50.5	1762.9	-2.11	0.13	9.06
9740.0	1559.549	-91.143	-6363.741	7580.6	51.8	1853.3	-2.22	0.13	9.03
9750.0	1635.243	-90.619	-6344.757	7558.0	53.1	1943.5	-2.32	0.13	9.00
9760.0	1710.705	-90.081	-6324.873	7534.3	54.4	2033.4	-2.43	0.13	8.98
9770.0	1785.925	-89.531	-6304.091	7509.5	55.6	2122.9	-2.54	0.13	8.95
9780.0	1860.891	-88.969	-6282.415	7483.6	56.9	2212.2	-2.64	0.12	8.91
9790.0	1935.593	-88.393	-6259.847	7456.7	58.2	2301.2	-2.75	0.12	8.88
9800.0	2010.020	-87.806	-6236.391	7428.7	59.4	2389.9	-2.85	0.12	8.85
9810.0	2084.163	-87.205	-6212.051	7399.6	60.7	2478.2	-2.96	0.12	8.81
9820.0	2158.010	-86.592	-6186.829	7369.5	61.9	2566.1	-3.06	0.12	8.78
9830.0	2231.550	-85.967	-6160.729	7338.4	63.1	2653.7	-3.17	0.12	8.74
9840.0	2304.774	-85.330	-6133.756	7306.2	64.4	2740.9	-3.27	0.12	8.70
9850.0	2377.672	-84.680	-6105.912	7273.0	65.6	2827.8	-3.38	0.12	8.66
9860.0	2450.231	-84.018	-6077.202	7238.8	66.8	2914.2	-3.48	0.12	8.62
9870.0	2522.444	-83.344	-6047.630	7203.5	68.0	3000.2	-3.58	0.12	8.58
9880.0	2594.298	-82.659	-6017.200	7167.2	69.2	3085.8	-3.68	0.12	8.54
9890.0	2665.785	-81.961	-5985.916	7129.9	70.4	3170.9	-3.78	0.12	8.49
9900.0	2736.893	-81.251	-5953.784	7091.6	71.5	3255.6	-3.89	0.12	8.45
9910.0	2807.613	-80.530	-5920.806	7052.3	72.7	3339.8	-3.99	0.11	8.40
9920.0	2877.934	-79.797	-5886.989	7011.9	73.9	3423.5	-4.09	0.11	8.35
9930.0	2947.848	-79.053	-5852.337	6970.6	75.0	3506.8	-4.18	0.11	8.30
9940.0	3017.343	-78.297	-5816.855	6928.3	76.1	3589.6	-4.28	0.11	8.25
9950.0	3086.410	-77.530	-5780.548	6885.0	77.3	3671.8	-4.38	0.11	8.20
9960.0	3155.040	-76.752	-5743.421	6840.7	78.4	3753.5	-4.48	0.11	8.15
9970.0	3223.222	-75.962	-5705.479	6795.5	79.5	3834.7	-4.57	0.11	8.09
9980.0	3290.946	-75.162	-5666.728	6749.3	80.6	3915.4	-4.67	0.11	8.04
9990.0	3358.204	-74.350	-5627.173	6702.1	81.7	3995.5	-4.77	0.11	7.98
10000.0	3424.985	-73.528	-5586.821	6654.0	82.8	4075.0	-4.86	0.11	7.92
10010.0	3490.722	-72.848	-5545.612	6607.2	84.0	4150.8	-4.96	0.11	7.87

TABLE B-VI. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS - SECOND BURN AND TRANSUNAR PHASES (CONT.)

TIME SEC	XS KM	YS KM	ZS KM	DXS M/S	DYS M/S	DZS M/S	DDXS M/S SQ	DDYS M/S SQ	DDZS M/S SQ
10020.0	3556.545	-72.003	-5503.711	6557.2	85.1	4229.2	-5.05	0.10	7.81
10030.0	3621.863	-71.147	-5461.030	6506.3	86.1	4306.9	-5.14	0.10	7.75
10040.0	3686.667	-70.281	-5417.575	6454.4	87.1	4384.1	-5.23	0.10	7.68
10050.0	3750.948	-69.404	-5373.351	6401.7	88.2	4460.6	-5.32	0.10	7.62
10060.0	3814.697	-68.517	-5328.365	6348.0	89.2	4536.5	-5.41	0.10	7.56
10070.0	3877.905	-67.620	-5282.623	6293.4	90.2	4611.7	-5.50	0.10	7.49
10080.0	3940.563	-66.713	-5236.133	6238.0	91.2	4686.3	-5.59	0.10	7.42
10090.0	4002.662	-65.796	-5188.900	6181.7	92.2	4760.2	-5.68	0.10	7.36
10100.0	4064.193	-64.870	-5140.931	6124.5	93.2	4833.4	-5.77	0.10	7.29
10110.0	4125.148	-63.933	-5092.233	6066.4	94.1	4906.0	-5.85	0.09	7.22
10120.0	4185.518	-62.987	-5042.814	6007.4	95.1	4977.8	-5.94	0.09	7.15
10130.0	4245.294	-62.032	-4992.679	5947.7	96.0	5049.0	-6.02	0.09	7.08
10140.0	4304.469	-61.067	-4941.837	5887.1	96.9	5119.4	-6.11	0.09	7.01
10150.0	4363.033	-60.093	-4890.293	5825.6	97.8	5189.1	-6.19	0.09	6.93
10160.0	4420.979	-59.111	-4838.056	5763.4	98.7	5258.1	-6.27	0.09	6.86
10170.0	4478.298	-58.119	-4785.134	5700.3	99.6	5326.3	-6.35	0.09	6.79
10180.0	4534.982	-57.118	-4731.532	5636.4	100.5	5393.8	-6.42	0.09	6.71
10190.0	4591.024	-56.109	-4677.260	5571.7	101.4	5460.5	-6.51	0.08	6.64
10200.0	4646.414	-55.091	-4622.325	5506.3	102.2	5526.4	-6.57	0.08	6.55
S-IVB RE-IGNITION (STDV OPEN)									
10202.900	4662.355	-54.794	-4606.271	5487.2	102.4	5545.3	-6.59	0.08	6.53
10204.0	4668.387	-54.682	-4600.166	5480.6	102.5	5553.4	-5.40	0.10	8.19
10206.0	4679.340	-54.477	-4589.042	5473.6	102.7	5572.8	-2.74	0.07	10.30
10208.0	4690.283	-54.271	-4577.875	5468.3	102.8	5593.5	-2.65	0.06	10.40
10210.0	4701.213	-54.065	-4566.668	5462.9	102.9	5614.4	-2.69	0.05	10.44
10212.0	4712.133	-53.859	-4555.419	5457.5	103.0	5635.3	-2.73	0.05	10.48
10214.0	4723.042	-53.653	-4544.128	5452.0	103.1	5656.3	-2.80	0.04	10.56
10216.0	4733.940	-53.447	-4532.794	5446.3	103.2	5677.6	-2.94	0.05	10.73
10218.0	4744.826	-53.240	-4521.417	5440.2	103.3	5699.2	-3.07	0.05	10.89
10220.0	4755.700	-53.034	-4509.997	5434.0	103.4	5721.1	-3.13	0.05	10.95
10222.0	4766.562	-52.827	-4498.533	5427.7	103.5	5743.0	-3.10	0.05	10.93
10224.0	4777.411	-52.620	-4487.025	5421.5	103.6	5764.8	-3.09	0.06	10.91
10226.0	4788.248	-52.412	-4475.474	5415.3	103.8	5786.6	-3.11	0.07	10.92
10228.0	4799.072	-52.205	-4463.878	5409.1	103.9	5808.5	-3.14	0.09	10.94
10230.0	4809.884	-51.997	-4452.240	5402.8	104.1	5830.4	-3.16	0.10	10.96
10232.0	4820.683	-51.788	-4440.557	5396.4	104.3	5852.3	-3.16	0.10	10.95
10234.0	4831.470	-51.579	-4428.830	5390.1	104.5	5874.2	-3.16	0.11	10.94
10236.0	4842.244	-51.370	-4417.060	5383.8	104.7	5896.1	-3.17	0.11	10.94
10238.0	4853.005	-51.160	-4405.246	5377.4	105.0	5918.0	-3.19	0.12	10.95
10240.0	4863.754	-50.950	-4393.388	5371.0	105.2	5939.9	-3.22	0.12	10.96
10242.0	4874.489	-50.739	-4381.487	5364.6	105.5	5961.8	-3.24	0.12	10.97



TABLE B-VI. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS - SECOND BURN AND TRANSLUNAR PHASES (CONT.)

TIME SEC	XS KM	YS KM	ZS KM	DXS M/S	DYS M/S	DZS M/S	DDXS M/S SQ	DDYS M/S SQ	DDZS M/S SQ
10244.0	4885.212	-50.528	-4369.541	5358.1	105.7	5983.8	-3.25	0.12	10.99
10246.0	4895.922	-50.317	-4357.551	5351.6	106.0	6005.7	-3.25	0.13	10.99
10248.0	4906.618	-50.104	-4345.518	5345.1	106.2	6027.7	-3.26	0.14	10.98
10250.0	4917.302	-49.892	-4333.441	5338.5	106.5	6049.7	-3.28	0.14	10.98
10252.0	4927.973	-49.678	-4321.319	5332.0	106.8	6071.6	-3.29	0.15	10.98
10254.0	4938.630	-49.464	-4309.154	5325.4	107.1	6093.6	-3.30	0.15	10.98
10256.0	4949.274	-49.250	-4296.945	5318.8	107.4	6115.5	-3.31	0.16	10.98
10258.0	4959.905	-49.035	-4284.692	5312.2	107.7	6137.5	-3.32	0.16	10.98
10260.0	4970.523	-48.819	-4272.394	5305.6	108.1	6159.7	-2.94	0.15	11.59
10262.0	4981.129	-48.603	-4260.051	5299.9	108.4	6183.0	-2.84	0.15	11.69
10264.0	4991.723	-48.386	-4247.661	5294.2	108.7	6206.4	-2.85	0.15	11.70
10266.0	5002.306	-48.168	-4235.225	5288.5	109.0	6229.8	-2.86	0.15	11.71
10268.0	5012.877	-47.950	-4222.742	5282.8	109.3	6253.2	-2.86	0.16	11.72
10270.0	5023.437	-47.731	-4210.212	5277.1	109.6	6276.7	-2.87	0.16	11.74
10272.0	5033.985	-47.512	-4197.635	5271.3	109.9	6300.2	-2.88	0.17	11.75
10274.0	5044.522	-47.292	-4185.011	5265.6	110.2	6323.7	-2.88	0.16	11.76
10276.0	5055.048	-47.071	-4172.340	5259.8	110.5	6347.2	-2.89	0.16	11.77
10278.0	5065.561	-46.850	-4159.622	5254.0	110.9	6370.8	-2.90	0.16	11.77
10280.0	5076.064	-46.628	-4146.857	5248.2	111.2	6394.3	-2.91	0.16	11.77
10282.0	5086.554	-46.405	-4134.045	5242.4	111.5	6417.9	-2.92	0.17	11.77
10284.0	5097.033	-46.182	-4121.186	5236.6	111.9	6441.4	-2.92	0.18	11.79
10286.0	5107.500	-45.958	-4108.279	5230.7	112.2	6465.0	-2.92	0.18	11.80
10288.0	5117.956	-45.733	-4095.326	5224.9	112.6	6488.6	-2.93	0.18	11.81
10290.0	5128.400	-45.507	-4082.325	5219.0	112.9	6512.2	-2.94	0.18	11.81
10292.0	5138.832	-45.281	-4069.277	5213.1	113.3	6535.8	-2.95	0.17	11.81
10294.0	5149.252	-45.054	-4056.181	5207.2	113.6	6559.5	-2.94	0.17	11.81
10296.0	5159.661	-44.827	-4043.039	5201.4	114.0	6583.1	-2.93	0.17	11.81
10298.0	5170.058	-44.598	-4029.849	5195.5	114.3	6606.7	-2.93	0.17	11.81
10300.0	5180.443	-44.369	-4016.612	5189.6	114.7	6630.3	-2.94	0.18	11.81
10302.0	5190.816	-44.140	-4003.328	5183.7	115.0	6654.0	-2.95	0.18	11.82
10304.0	5201.178	-43.909	-3989.996	5177.8	115.4	6677.6	-2.96	0.18	11.84
10306.0	5211.528	-43.678	-3976.617	5171.9	115.8	6701.3	-2.97	0.18	11.85
10308.0	5221.865	-43.446	-3963.191	5165.9	116.1	6725.0	-2.98	0.17	11.86
10310.0	5232.191	-43.214	-3949.717	5160.0	116.5	6748.8	-2.99	0.18	11.87
10312.0	5242.505	-42.980	-3936.196	5154.0	116.8	6772.5	-3.00	0.18	11.88
10314.0	5252.807	-42.746	-3922.627	5148.0	117.2	6796.3	-3.01	0.18	11.89
10316.0	5263.097	-42.512	-3909.011	5142.0	117.5	6820.1	-3.01	0.17	11.90
10318.0	5273.375	-42.276	-3895.347	5136.0	117.9	6843.9	-3.02	0.17	11.91
10320.0	5283.641	-42.040	-3881.635	5129.9	118.2	6867.7	-3.02	0.17	11.92
10322.0	5293.895	-41.803	-3867.876	5123.9	118.6	6891.6	-3.02	0.18	11.93
10324.0	5304.137	-41.566	-3854.069	5117.8	118.9	6915.4	-3.03	0.18	11.94
10326.0	5314.366	-41.327	-3840.214	5111.8	119.3	6939.3	-3.03	0.19	11.95
10328.0	5324.584	-41.088	-3826.312	5105.7	119.7	6963.2	-3.04	0.18	11.96

TABLE B-VI. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS - SECOND BURN AND TRANSUNAR PHASES (CONT.)

TIME SEC	XS KM	YS KM	ZS KM	DXS M/S	DYS M/S	DZS M/S	DDXS M/S SQ	DDYS M/S SQ	DDZS M/S SQ
10330.0	5334.789	-40.849	-3812.361	5099.6	120.1	6987.2	-3.05	0.18	11.98
10332.0	5344.982	-40.608	-3798.363	5093.5	120.4	7011.1	-3.05	0.18	11.99
10334.0	5355.163	-40.367	-3784.317	5087.4	120.8	7035.1	-3.06	0.19	11.99
10336.0	5365.332	-40.125	-3770.222	5081.3	121.2	7059.1	-3.07	0.18	12.00
10338.0	5375.488	-39.882	-3756.080	5075.1	121.5	7083.1	-3.07	0.18	12.01
10340.0	5385.632	-39.639	-3741.890	5069.0	121.9	7107.2	-3.08	0.19	12.03
10342.0	5395.764	-39.395	-3727.652	5062.8	122.3	7131.2	-3.09	0.19	12.04
10344.0	5405.884	-39.150	-3713.365	5056.7	122.6	7155.3	-3.09	0.19	12.05
10346.0	5415.991	-38.904	-3699.030	5050.5	123.0	7179.4	-3.09	0.18	12.06
10348.0	5426.085	-38.658	-3684.647	5044.3	123.4	7203.6	-3.10	0.18	12.07
10350.0	5436.168	-38.411	-3670.216	5038.1	123.7	7227.7	-3.10	0.18	12.09
10352.0	5446.238	-38.163	-3655.736	5031.9	124.1	7251.9	-3.10	0.19	12.10
10354.0	5456.295	-37.914	-3641.208	5025.7	124.5	7276.1	-3.11	0.19	12.11
10356.0	5466.340	-37.665	-3626.632	5019.5	124.9	7300.3	-3.12	0.19	12.12
10358.0	5476.373	-37.415	-3612.007	5013.2	125.3	7324.6	-3.12	0.19	12.14
10360.0	5486.393	-37.164	-3597.333	5007.0	125.6	7348.9	-3.13	0.19	12.15
10362.0	5496.401	-36.912	-3582.611	5000.7	126.0	7373.2	-3.13	0.19	12.16
10364.0	5506.396	-36.660	-3567.840	4994.5	126.4	7397.6	-3.13	0.19	12.17
10366.0	5516.379	-36.407	-3553.021	4988.2	126.8	7421.9	-3.13	0.19	12.19
10368.0	5526.349	-36.153	-3538.153	4982.0	127.2	7446.3	-3.13	0.19	12.20
10370.0	5536.307	-35.898	-3523.236	4975.7	127.5	7470.7	-3.13	0.19	12.22
10372.0	5546.252	-35.643	-3508.270	4969.5	127.9	7495.2	-3.13	0.20	12.24
10374.0	5556.185	-35.386	-3493.255	4963.2	128.3	7519.7	-3.14	0.20	12.25
10376.0	5566.105	-35.129	-3478.191	4956.9	128.7	7544.2	-3.15	0.20	12.26
10378.0	5576.012	-34.871	-3463.078	4950.6	129.1	7568.7	-3.15	0.19	12.27
10380.0	5585.907	-34.613	-3447.916	4944.3	129.5	7593.3	-3.15	0.19	12.28
10382.0	5595.790	-34.353	-3432.705	4938.0	129.9	7617.8	-3.14	0.19	12.30
10384.0	5605.659	-34.093	-3417.445	4931.7	130.3	7642.4	-3.16	0.20	12.31
10386.0	5615.517	-33.832	-3402.135	4925.4	130.7	7667.1	-3.16	0.20	12.33
10388.0	5625.361	-33.571	-3386.777	4919.1	131.1	7691.8	-3.17	0.21	12.35
10390.0	5635.193	-33.308	-3371.368	4912.8	131.5	7716.5	-3.17	0.20	12.36
10392.0	5645.012	-33.045	-3355.911	4906.5	131.9	7741.2	-3.16	0.19	12.38
10394.0	5654.819	-32.780	-3340.403	4900.1	132.3	7766.0	-3.16	0.19	12.40
10396.0	5664.613	-32.516	-3324.847	4893.8	132.6	7790.8	-3.17	0.20	12.41
10398.0	5674.394	-32.250	-3309.240	4887.5	133.0	7815.6	-3.17	0.21	12.42
10400.0	5684.163	-31.983	-3293.584	4881.2	133.5	7840.5	-3.17	0.21	12.44
10402.0	5693.919	-31.716	-3277.878	4874.8	133.9	7865.4	-3.17	0.20	12.47
10404.0	5703.662	-31.448	-3262.122	4868.5	134.3	7890.4	-3.17	0.20	12.48
10406.0	5713.393	-31.179	-3246.317	4862.1	134.7	7915.3	-3.17	0.20	12.50
10408.0	5723.111	-30.909	-3230.461	4855.8	135.1	7940.4	-3.17	0.20	12.51
10410.0	5732.816	-30.638	-3214.555	4849.4	135.5	7965.4	-3.17	0.20	12.53
10412.0	5742.509	-30.367	-3198.599	4843.1	135.9	7990.5	-3.17	0.20	12.55
10414.0	5752.188	-30.095	-3182.593	4836.8	136.3	8015.6	-3.17	0.20	12.57

TABLE B-VI. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS - SECOND BURN AND TRANSLUNAR PHASES (CONT.)

TIME SEC	XS KM	YS KM	ZS KM	DXS M/S	DYS M/S	DZS M/S	DDXS M/S SQ	DDYS M/S SQ	DDZS M/S SQ
10416.0	5761.856	-29.822	-3166.537	4830.4	136.7	8040.8	-3.17	0.20	12.60
10418.0	5771.510	-29.548	-3150.430	4824.1	137.1	8066.0	-3.17	0.21	12.62
10420.0	5781.152	-29.273	-3134.273	4817.7	137.6	8091.2	-3.17	0.21	12.63
10422.0	5790.781	-28.998	-3118.065	4811.4	138.0	8116.5	-3.17	0.22	12.64
10424.0	5800.397	-28.721	-3101.807	4805.1	138.4	8141.8	-3.17	0.21	12.67
10426.0	5810.001	-28.444	-3085.498	4798.7	138.8	8167.2	-3.18	0.21	12.70
10428.0	5819.592	-28.166	-3069.138	4792.3	139.3	8192.6	-3.18	0.21	12.73
10430.0	5829.171	-27.887	-3052.727	4786.0	139.7	8218.1	-3.18	0.21	12.74
10432.0	5838.736	-27.607	-3036.266	4779.6	140.1	8243.6	-3.17	0.21	12.75
10434.0	5848.289	-27.327	-3019.753	4773.3	140.5	8269.1	-3.17	0.21	12.78
10436.0	5857.829	-27.045	-3003.189	4767.0	140.9	8294.7	-3.17	0.21	12.81
10438.0	5867.357	-26.763	-2986.574	4760.6	141.4	8320.4	-3.17	0.21	12.84
10440.0	5876.872	-26.480	-2969.908	4754.3	141.8	8346.0	-3.18	0.21	12.86
10442.0	5886.374	-26.196	-2953.190	4747.9	142.2	8371.8	-3.18	0.22	12.88
10444.0	5895.864	-25.911	-2936.421	4741.5	142.7	8397.6	-3.18	0.22	12.90
10446.0	5905.340	-25.625	-2919.600	4735.2	143.1	8423.4	-3.18	0.22	12.93
10448.0	5914.804	-25.338	-2902.727	4728.8	143.6	8449.3	-3.18	0.22	12.95
10450.0	5924.256	-25.051	-2885.803	4722.5	144.0	8475.2	-3.18	0.22	12.97
10452.0	5933.694	-24.762	-2868.826	4716.1	144.4	8501.1	-3.17	0.22	13.00
10454.0	5943.120	-24.473	-2851.798	4709.8	144.9	8527.2	-3.17	0.22	13.03
10456.0	5952.533	-24.183	-2834.718	4703.4	145.3	8553.3	-3.17	0.22	13.06
10458.0	5961.934	-23.892	-2817.585	4697.1	145.7	8579.4	-3.18	0.22	13.09
10460.0	5971.322	-23.600	-2800.400	4690.7	146.2	8605.6	-3.18	0.22	13.12
10462.0	5980.697	-23.307	-2783.162	4684.4	146.6	8631.9	-3.18	0.23	13.16
10464.0	5990.059	-23.013	-2765.872	4678.0	147.1	8658.3	-3.17	0.23	13.20
10466.0	5999.409	-22.719	-2748.529	4671.7	147.6	8684.7	-3.17	0.23	13.24
10468.0	6008.746	-22.423	-2731.133	4665.3	148.0	8711.2	-3.16	0.23	13.27
10470.0	6018.070	-22.126	-2713.684	4659.0	148.5	8737.8	-3.16	0.22	13.31
10472.0	6027.382	-21.829	-2696.182	4652.7	148.9	8764.5	-3.16	0.22	13.34
10474.0	6036.681	-21.531	-2678.626	4646.4	149.4	8791.2	-3.16	0.23	13.37
10476.0	6045.967	-21.232	-2661.017	4640.1	149.8	8817.9	-3.16	0.23	13.39
10478.0	6055.241	-20.932	-2643.355	4633.7	150.3	8844.7	-3.16	0.23	13.42
10480.0	6064.502	-20.631	-2625.638	4627.4	150.7	8871.6	-3.17	0.23	13.46
10482.0	6073.751	-20.329	-2607.868	4621.1	151.2	8898.6	-3.17	0.23	13.50
10484.0	6082.987	-20.026	-2590.044	4614.7	151.6	8925.6	-3.17	0.22	13.54
10486.0	6092.210	-19.722	-2572.166	4608.4	152.1	8952.7	-3.17	0.23	13.58
10488.0	6101.420	-19.418	-2554.233	4602.0	152.6	8979.9	-3.18	0.25	13.62
10490.0	6110.618	-19.112	-2536.246	4595.7	153.1	9007.2	-3.18	0.26	13.66
10492.0	6119.803	-18.805	-2518.204	4589.3	153.6	9034.6	-3.18	0.26	13.71
10494.0	6128.975	-18.498	-2500.107	4583.0	154.1	9062.0	-3.18	0.26	13.75
10496.0	6138.135	-18.189	-2481.956	4576.6	154.6	9089.6	-3.19	0.25	13.79
10498.0	6147.282	-17.879	-2463.749	4570.2	155.1	9117.2	-3.20	0.25	13.83
10500.0	6156.416	-17.569	-2445.487	4563.8	155.6	9144.9	-3.20	0.25	13.88

TABLE B-VI. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS - SECOND BURN AND TRANSLUNAR PHASES (CONT.)

TIME SEC	XS KM	YS KM	ZS KM	DXS M/S	DYS M/S	DZS M/S	DDXS M/S SQ	DDYS M/S SQ	DDZS M/S SQ
10502.0	6165.537	-17.257	-2427.169	4557.4	156.1	9172.7	-3.21	0.25	13.92
10504.0	6174.645	-16.944	-2408.796	4551.0	156.6	9200.6	-3.23	0.25	13.96
10506.0	6183.741	-16.631	-2390.367	4544.5	157.1	9228.6	-3.24	0.24	14.00
10508.0	6192.823	-16.316	-2371.882	4538.0	157.6	9256.6	-3.25	0.25	14.04
10510.0	6201.893	-16.000	-2353.341	4531.5	158.1	9284.7	-3.26	0.25	14.08
10512.0	6210.949	-15.684	-2334.743	4525.0	158.6	9312.9	-3.27	0.26	14.13
10514.0	6219.993	-15.366	-2316.089	4518.4	159.1	9341.3	-3.29	0.26	14.19
10516.0	6229.023	-15.047	-2297.378	4511.8	159.6	9369.7	-3.29	0.26	14.25
10518.0	6238.040	-14.727	-2278.610	4505.2	160.1	9398.2	-3.30	0.26	14.30
10520.0	6247.044	-14.407	-2259.785	4498.6	160.7	9426.9	-3.32	0.26	14.35
10522.0	6256.035	-14.085	-2240.902	4492.0	161.2	9455.6	-3.33	0.26	14.40
10524.0	6265.012	-13.762	-2221.962	4485.3	161.7	9484.5	-3.33	0.27	14.45
10526.0	6273.976	-13.438	-2202.964	4478.6	162.3	9513.4	-3.38	0.27	14.53
10528.0	6282.926	-13.113	-2183.908	4471.7	162.8	9542.6	-3.53	0.28	14.65
10530.0	6291.863	-12.787	-2164.794	4464.5	163.4	9572.1	-3.70	0.28	14.78
10532.0	6300.784	-12.459	-2145.620	4457.0	163.9	9601.7	-3.74	0.28	14.86
10534.0	6309.691	-12.131	-2126.387	4449.5	164.5	9631.4	-3.74	0.28	14.89
10536.0	6318.582	-11.801	-2107.094	4442.0	165.1	9661.3	-3.69	0.28	14.92
10538.0	6327.459	-11.471	-2087.742	4434.7	165.6	9691.2	-3.65	0.29	14.97
10540.0	6336.321	-11.139	-2068.329	4427.4	166.2	9721.1	-3.61	0.28	15.01
10542.0	6345.169	-10.806	-2048.857	4420.2	166.8	9751.2	-3.59	0.28	15.05
10544.0	6354.002	-10.472	-2029.325	4413.1	167.3	9781.3	-3.56	0.28	15.09
10546.0	6362.821	-10.136	-2009.732	4406.0	167.9	9811.5	-3.52	0.29	15.14
10548.0	6371.626	-9.800	-1990.078	4399.0	168.5	9841.8	-3.49	0.29	15.18
10550.0	6380.417	-9.463	-1970.364	4392.1	169.1	9872.2	-3.46	0.29	15.22
10552.0	6389.195	-9.124	-1950.589	4385.2	169.6	9902.7	-3.43	0.29	15.26
S-IVB 2ND GUIDANCE CUTOFF									
10553.610	6396.250	-8.851	-1934.626	4379.7	170.1	9927.3	-3.41	0.29	15.30
10554.0	6397.958	-8.784	-1930.754	4377.5	170.2	9931.3	-7.58	-0.11	5.42
10556.0	6406.696	-8.444	-1910.887	4360.7	170.2	9937.1	-8.54	0.02	2.53
10558.0	6415.400	-8.104	-1891.007	4343.6	170.2	9942.1	-8.55	0.02	2.51
10560.0	6424.070	-7.763	-1871.118	4326.5	170.3	9947.1	-8.56	0.02	2.49
10562.0	6432.706	-7.423	-1851.219	4309.4	170.3	9952.1	-8.56	0.02	2.46
TRANSLUNAR INJECTION (TLI)									
10563.610	6439.633	-7.148	-1835.193	4295.6	170.3	9956.0	-8.56	0.02	2.44
10564.0	6588.818	-0.488	-1471.282	3982.4	173.2	10037.7	-8.54	0.01	1.91
10566.0	6777.303	8.180	-967.312	3557.9	173.4	10115.2	-8.42	-0.00	1.20
10568.0	6944.748	16.847	-460.329	3141.6	173.1	10158.6	-8.21	-0.01	0.54
10570.0	7091.675	25.486	48.023	2737.8	172.4	10170.5	-7.93	-0.02	-0.06

TABLE B-VI. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS - SECOND BURN AND TRANSLUNAR PHASES (CONT.)

TIME SEC	XS KM	YS KM	ZS KM	DXS M/S	DYS M/S	DZS M/S	DOXS M/S SQ	DOYS M/S SQ	DDZS M/S SQ
10800.0	7218.793	34.076	556.252	2369.8	171.2	10154.2	-7.58	-0.03	-0.59
10850.0	7326.959	42.598	1063.032	1980.1	169.6	10113.2	-7.20	-0.03	-1.05
10900.0	7417.132	51.033	1567.213	1630.3	167.8	10050.9	-6.79	-0.04	-1.43
10950.0	7490.339	59.369	2067.823	1301.5	165.6	9970.8	-6.36	-0.04	-1.76
11000.0	7547.634	67.595	2564.052	993.9	163.4	9876.2	-5.94	-0.05	-2.02
11050.0	7590.075	75.702	3055.248	707.3	160.9	9769.9	-5.52	-0.05	-2.22
11100.0	7618.703	83.684	3540.895	441.2	158.4	9654.7	-5.12	-0.05	-2.38
11150.0	7634.521	91.536	4020.601	194.8	155.7	9532.6	-4.74	-0.05	-2.49
11200.0	7638.491	99.257	4494.078	-32.9	153.1	9405.8	-4.37	-0.05	-2.57
11250.0	7631.520	106.845	4961.128	-243.1	150.4	9275.8	-4.03	-0.05	-2.62
11300.0	7614.458	114.300	5421.628	-436.7	147.8	9144.0	-3.72	-0.05	-2.65
11350.0	7588.100	121.622	5875.519	-615.1	145.1	9011.6	-3.42	-0.05	-2.65
11400.0	7553.181	128.813	6322.790	-779.4	142.5	8879.4	-3.15	-0.05	-2.64
11450.0	7510.381	135.876	6763.471	-930.6	140.0	8748.1	-2.90	-0.05	-2.61
11500.0	7460.325	142.815	7197.626	-1069.7	137.5	8618.4	-2.67	-0.05	-2.58
11550.0	7403.591	149.631	7625.343	-1197.9	135.1	8490.7	-2.46	-0.05	-2.53
11600.0	7340.708	156.325	8046.732	-1315.8	132.7	8355.3	-2.27	-0.05	-2.48
11650.0	7272.161	162.901	8461.916	-1424.6	130.4	8242.5	-2.09	-0.05	-2.43
11700.0	7198.392	169.364	8871.030	-1524.8	128.1	8122.5	-1.93	-0.04	-2.37
11750.0	7119.810	175.717	9274.217	-1617.3	126.0	8005.4	-1.78	-0.04	-2.31
11800.0	7036.784	181.964	9671.622	-1702.6	123.9	7891.3	-1.64	-0.04	-2.25
11850.0	6949.659	188.106	10063.396	-1781.4	121.8	7780.2	-1.52	-0.04	-2.19
11900.0	6858.745	194.148	10449.689	-1854.2	119.8	7672.0	-1.40	-0.04	-2.13
11950.0	6764.330	200.091	10830.650	-1921.5	117.9	7566.9	-1.30	-0.04	-2.07
12000.0	6666.677	205.939	11206.430	-1983.8	116.0	7464.7	-1.20	-0.04	-2.01
12050.0	6566.026	211.695	11577.173	-2041.5	114.3	7365.5	-1.11	-0.04	-1.96
12100.0	6462.598	217.365	11943.025	-2094.9	112.5	7269.1	-1.03	-0.04	-1.90
12147.200	CSM SEPARATION 6362.597	222.645	12284.010	-2141.8	111.0	7180.6	-0.96	-0.04	-1.85

TABLE B-VII. GEOGRAPHIC POLAR COORDINATES - SECOND BURN AND TRANSLUNAR PHASES

TIME SEC	GC DIST KM	LONG DEG E	GC LAT DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	ALTITUDE M
9624.800	6552.224	158.6702	-5.0669	58.87	0.03	7393.1	60.68	0.03	7804.4	174226
9630.0	6552.269	158.9590	-4.8931	58.85	0.03	7393.1	60.65	0.03	7804.4	174259
9640.0	6552.308	159.5140	-4.5584	58.79	0.03	7393.1	60.60	0.03	7804.4	174278
9650.0	6552.348	160.0684	-4.2232	58.74	0.03	7393.1	60.56	0.03	7804.4	174298
9660.0	6552.386	160.6223	-3.8875	58.70	0.03	7393.1	60.52	0.03	7804.3	174319
9670.0	6552.425	161.1757	-3.5514	58.66	0.03	7393.1	60.48	0.03	7804.3	174341
9680.0	6552.463	161.7286	-3.2150	58.62	0.03	7393.0	60.44	0.03	7804.3	174365
9690.0	6552.501	162.2812	-2.8782	58.58	0.03	7393.0	60.41	0.03	7804.2	174389
9700.0	6552.539	162.8334	-2.5411	58.55	0.03	7393.0	60.38	0.03	7804.2	174415
9710.0	6552.576	163.3853	-2.2037	58.53	0.03	7393.0	60.36	0.03	7804.2	174442
9720.0	6552.613	163.9370	-1.8661	58.51	0.03	7392.9	60.34	0.03	7804.1	174470
9730.0	6552.650	164.4883	-1.5283	58.49	0.03	7392.9	60.32	0.03	7804.1	174499
9740.0	6552.686	165.0395	-1.1903	58.47	0.03	7392.9	60.31	0.03	7804.1	174530
9750.0	6552.722	165.5906	-0.8522	58.46	0.03	7392.8	60.29	0.03	7804.0	174561
9760.0	6552.758	166.1415	-0.5140	58.45	0.03	7392.8	60.29	0.03	7804.0	174594
9770.0	6552.794	166.6924	-0.1758	58.45	0.03	7392.8	60.28	0.03	7804.0	174628
9780.0	6552.829	167.2432	0.1624	58.45	0.03	7392.7	60.28	0.03	7803.9	174663
9790.0	6552.863	167.7941	0.5007	58.45	0.03	7392.7	60.29	0.03	7803.9	174699
9800.0	6552.898	168.3450	0.8388	58.46	0.03	7392.6	60.29	0.03	7803.9	174736
9810.0	6552.932	168.8960	1.1769	58.47	0.03	7392.6	60.30	0.02	7803.8	174775
9820.0	6552.966	169.4471	1.5148	58.49	0.03	7392.6	60.32	0.02	7803.8	174815
9830.0	6552.999	169.9984	1.8526	58.50	0.03	7392.5	60.34	0.02	7803.8	174855
9840.0	6553.032	170.5500	2.1902	58.53	0.03	7392.5	60.36	0.02	7803.7	174897
9850.0	6553.065	171.1018	2.5275	58.55	0.03	7392.4	60.38	0.02	7803.7	174940
9860.0	6553.097	171.6539	2.8646	58.58	0.02	7392.4	60.41	0.02	7803.6	174985
9870.0	6553.129	172.2064	3.2013	58.62	0.02	7392.3	60.44	0.02	7803.6	175030
9880.0	6553.160	172.7592	3.5377	58.65	0.02	7392.3	60.48	0.02	7803.6	175076
9890.0	6553.192	173.3125	3.8738	58.70	0.02	7392.2	60.52	0.02	7803.5	175124
9900.0	6553.222	173.8662	4.2094	58.74	0.02	7392.2	60.56	0.02	7803.5	175172
9910.0	6553.253	174.4204	4.5445	58.79	0.02	7392.1	60.60	0.02	7803.4	175222
9920.0	6553.283	174.9752	4.8791	58.84	0.02	7392.1	60.65	0.02	7803.4	175272
9930.0	6553.313	175.5306	5.2132	58.90	0.02	7392.0	60.70	0.02	7803.4	175324
9940.0	6553.342	176.0866	5.5468	58.96	0.02	7391.9	60.76	0.02	7803.3	175377
9950.0	6553.371	176.6433	5.8797	59.02	0.02	7391.9	60.82	0.02	7803.3	175430
9960.0	6553.400	177.2007	6.2120	59.09	0.02	7391.8	60.88	0.02	7803.2	175485
9970.0	6553.428	177.7588	6.5436	59.16	0.02	7391.8	60.95	0.02	7803.2	175541
9980.0	6553.456	178.3178	6.8745	59.24	0.02	7391.7	61.02	0.02	7803.2	175598
9990.0	6553.483	178.8775	7.2047	59.32	0.02	7391.6	61.10	0.02	7803.1	175655
10000.0	6553.510	179.4382	7.5340	59.40	0.02	7391.6	61.17	0.02	7803.1	175714
10010.0	6553.187	179.9957	7.8619	59.49	0.05	7391.8	61.25	0.04	7803.3	175423

TABLE B-VII. GEOGRAPHIC POLAR COORDINATES - SECOND BURN AND TRANSUNAR PHASES (CONT.)

TIME SEC	GC DIST KM	LONG DEG E	GC LAT DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	ALTITUDE M
10020.0	6553.246	-179.4418	8.1895	59.58	0.05	7391.6	61.34	0.04	7803.2	175516
10030.0	6553.305	-178.8783	8.5163	59.67	0.05	7391.5	61.43	0.04	7803.1	175610
10040.0	6553.363	-178.3137	8.8421	59.77	0.05	7391.4	61.52	0.04	7803.0	175705
10050.0	6553.421	-177.7481	9.1669	59.88	0.04	7391.3	61.61	0.04	7802.9	175801
10060.0	6553.479	-177.1814	9.4907	59.98	0.04	7391.2	61.71	0.04	7802.8	175897
10070.0	6553.536	-176.6135	9.8135	60.09	0.04	7391.1	61.82	0.04	7802.8	175994
10080.0	6553.592	-176.0445	10.1351	60.21	0.04	7391.0	61.92	0.04	7802.7	176092
10090.0	6553.649	-175.4742	10.4556	60.32	0.04	7390.8	62.03	0.04	7802.6	176190
10100.0	6553.705	-174.9027	10.7749	60.44	0.04	7390.7	62.15	0.04	7802.5	176290
10110.0	6553.760	-174.3299	11.0930	60.57	0.04	7390.6	62.26	0.04	7802.5	176390
10120.0	6553.816	-173.7558	11.4099	60.70	0.04	7390.5	62.38	0.04	7802.4	176490
10130.0	6553.870	-173.1803	11.7254	60.83	0.04	7390.4	62.51	0.04	7802.3	176592
10140.0	6553.925	-172.6034	12.0396	60.97	0.04	7390.3	62.63	0.04	7802.3	176694
10150.0	6553.979	-172.0251	12.3525	61.11	0.04	7390.2	62.77	0.04	7802.2	176796
10160.0	6554.032	-171.4453	12.6639	61.25	0.04	7390.1	62.90	0.04	7802.2	176899
10170.0	6554.085	-170.8640	12.9739	61.40	0.04	7390.0	63.04	0.04	7802.1	177002
10180.0	6554.138	-170.2811	13.2823	61.55	0.04	7389.9	63.18	0.04	7802.1	177106
10190.0	6554.190	-169.6967	13.5893	61.71	0.04	7389.8	63.33	0.04	7802.0	177210
10200.0	6554.242	-169.1106	13.8946	61.87	0.04	7389.8	63.48	0.04	7802.0	177315
S-IVB RE-IGNITION (STDV OPEN)										
10202.900	6554.257	-168.9404	13.9829	61.92	0.04	7389.7	63.52	0.04	7802.0	177345
10204.0	6554.263	-168.8757	14.0163	61.94	0.04	7390.8	63.54	0.04	7803.1	177357
10206.0	6554.273	-168.7581	14.0771	61.97	0.04	7399.8	63.57	0.04	7812.0	177378
10208.0	6554.284	-168.6403	14.1379	62.00	0.04	7410.8	63.60	0.04	7823.1	177400
10210.0	6554.295	-168.5222	14.1988	62.04	0.04	7422.0	63.63	0.04	7834.3	177422
10212.0	6554.307	-168.4038	14.2596	62.07	0.05	7433.2	63.66	0.04	7845.5	177445
10214.0	6554.319	-168.2852	14.3205	62.11	0.05	7444.5	63.69	0.05	7856.8	177468
10216.0	6554.332	-168.1664	14.3814	62.14	0.05	7455.8	63.72	0.05	7868.1	177491
10218.0	6554.344	-168.0473	14.4423	62.18	0.05	7467.3	63.75	0.04	7879.6	177514
10220.0	6554.355	-167.9279	14.5033	62.21	0.04	7478.8	63.78	0.04	7891.1	177536
10222.0	6554.365	-167.8083	14.5643	62.25	0.04	7490.4	63.81	0.03	7902.7	177558
10224.0	6554.374	-167.6885	14.6252	62.28	0.03	7502.0	63.84	0.03	7914.3	177578
10226.0	6554.383	-167.5683	14.6863	62.32	0.03	7513.7	63.87	0.03	7926.0	177597
10228.0	6554.390	-167.4480	14.7473	62.35	0.03	7525.4	63.90	0.03	7937.7	177616
10230.0	6554.398	-167.3273	14.8084	62.39	0.03	7537.1	63.93	0.03	7949.5	177635
10232.0	6554.404	-167.2064	14.8694	62.43	0.03	7548.9	63.97	0.02	7961.3	177653
10234.0	6554.411	-167.0852	14.9305	62.46	0.02	7560.8	64.00	0.02	7973.1	177671
10236.0	6554.417	-166.9638	14.9917	62.50	0.02	7572.6	64.03	0.02	7985.0	177689
10238.0	6554.424	-166.8421	15.0528	62.54	0.02	7584.5	64.06	0.02	7996.9	177707
10240.0	6554.430	-166.7201	15.1140	62.58	0.03	7596.4	64.10	0.02	8008.8	177725
10242.0	6554.437	-166.5979	15.1751	62.62	0.03	7608.4	64.13	0.02	8020.8	177743

TABLE B-VII. GEOGRAPHIC POLAR COORDINATES - SECOND BURN AND TRANSLUNAR PHASES (CONT.)

TIME SEC	GC DIST KM	LONG DEG E	GC LAT DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	ALTITUDE M
10244.0	6554.444	-166.4753	15.2363	62.65	0.03	7620.4	64.17	0.03	8032.8	177762
10246.0	6554.452	-166.3526	15.2975	62.69	0.03	7632.4	64.20	0.03	8044.9	177781
10248.0	6554.460	-166.2295	15.3588	62.73	0.03	7644.5	64.23	0.03	8057.0	177801
10250.0	6554.468	-166.1062	15.4200	62.77	0.03	7656.6	64.27	0.03	8069.1	177821
10252.0	6554.478	-165.9826	15.4813	62.81	0.04	7668.8	64.30	0.04	8081.2	177843
10254.0	6554.489	-165.8587	15.5425	62.85	0.04	7680.9	64.34	0.04	8093.4	177865
10256.0	6554.500	-165.7345	15.6038	62.89	0.05	7693.1	64.37	0.04	8105.6	177889
10258.0	6554.513	-165.6101	15.6651	62.93	0.05	7705.4	64.41	0.05	8117.9	177914
10260.0	6554.528	-165.4853	15.7264	62.97	0.06	7717.8	64.45	0.05	8130.4	177940
10262.0	6554.543	-165.3603	15.7877	63.01	0.06	7731.8	64.48	0.06	8144.4	177968
10264.0	6554.561	-165.2350	15.8491	63.06	0.07	7745.9	64.52	0.06	8158.4	177997
10266.0	6554.580	-165.1093	15.9105	63.10	0.07	7760.0	64.56	0.07	8172.6	178028
10268.0	6554.600	-164.9834	15.9719	63.14	0.08	7774.2	64.59	0.08	8186.8	178061
10270.0	6554.623	-164.8571	16.0333	63.18	0.09	7788.4	64.63	0.08	8201.0	178096
10272.0	6554.648	-164.7305	16.0947	63.22	0.09	7802.7	64.67	0.09	8215.3	178133
10274.0	6554.675	-164.6036	16.1562	63.27	0.10	7817.1	64.70	0.10	8229.7	178172
10276.0	6554.704	-164.4764	16.2177	63.31	0.11	7831.5	64.74	0.11	8244.1	178214
10278.0	6554.736	-164.3488	16.2792	63.35	0.12	7845.9	64.78	0.12	8258.6	178258
10280.0	6554.771	-164.2209	16.3407	63.39	0.13	7860.4	64.82	0.13	8273.0	178305
10282.0	6554.808	-164.0927	16.4023	63.44	0.14	7874.9	64.86	0.14	8287.6	178355
10284.0	6554.849	-163.9642	16.4638	63.48	0.15	7889.5	64.89	0.15	8302.2	178409
10286.0	6554.894	-163.8353	16.5254	63.53	0.17	7904.1	64.93	0.16	8316.8	178466
10288.0	6554.941	-163.7062	16.5870	63.57	0.18	7918.8	64.97	0.17	8331.5	178526
10290.0	6554.993	-163.5767	16.6487	63.62	0.19	7933.5	65.01	0.18	8346.2	178590
10292.0	6555.048	-163.4468	16.7103	63.66	0.21	7948.3	65.05	0.20	8361.0	178658
10294.0	6555.108	-163.3166	16.7720	63.71	0.22	7963.1	65.09	0.21	8375.8	178730
10296.0	6555.172	-163.1861	16.8336	63.75	0.24	7977.9	65.13	0.23	8390.7	178807
10298.0	6555.240	-163.0553	16.8953	63.80	0.25	7992.8	65.17	0.24	8405.6	178888
10300.0	6555.313	-162.9241	16.9570	63.84	0.27	8007.8	65.21	0.26	8420.6	178974
10302.0	6555.391	-162.7926	17.0187	63.89	0.29	8022.8	65.25	0.27	8435.6	179065
10304.0	6555.475	-162.6607	17.0805	63.93	0.31	8037.8	65.30	0.29	8450.7	179162
10306.0	6555.563	-162.5285	17.1422	63.98	0.33	8052.9	65.34	0.31	8465.8	179264
10308.0	6555.658	-162.3959	17.2040	64.03	0.34	8068.1	65.38	0.33	8480.9	179371
10310.0	6555.758	-162.2630	17.2657	64.08	0.36	8083.2	65.42	0.35	8496.2	179484
10312.0	6555.864	-162.1298	17.3275	64.12	0.39	8098.5	65.46	0.37	8511.4	179603
10314.0	6555.976	-161.9962	17.3893	64.17	0.41	8113.8	65.51	0.39	8526.7	179728
10316.0	6556.094	-161.8623	17.4511	64.22	0.43	8129.1	65.55	0.41	8542.1	179860
10318.0	6556.218	-161.7280	17.5129	64.27	0.45	8144.5	65.59	0.43	8557.5	179998
10320.0	6556.350	-161.5934	17.5747	64.31	0.47	8159.9	65.63	0.45	8573.0	180142
10322.0	6556.488	-161.4584	17.6365	64.36	0.50	8175.4	65.68	0.47	8588.5	180294
10324.0	6556.633	-161.3230	17.6983	64.41	0.52	8191.0	65.72	0.50	8604.0	180452
10326.0	6556.786	-161.1873	17.7602	64.46	0.55	8206.6	65.77	0.52	8619.7	180618
10328.0	6556.946	-161.0513	17.8220	64.51	0.57	8222.2	65.81	0.54	8635.3	180792



TABLE B-VII. GEOGRAPHIC POLAR COORDINATES - SECOND BURN AND TRANSILUNAR PHASES (CONT.)

TIME SEC	GC DIST KM	LONG DEG E	GC LAT DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	ALTITUDE M
10330.0	6557.114	-160.9148	17.8838	64.56	0.60	8238.0	65.86	0.57	8651.1	180973
10332.0	6557.289	-160.7781	17.9457	64.61	0.62	8253.7	65.90	0.59	8666.9	181163
10334.0	6557.473	-160.6409	18.0075	64.66	0.65	8269.5	65.95	0.62	8682.7	181360
10336.0	6557.665	-160.5034	18.0694	64.71	0.68	8285.4	65.99	0.65	8698.6	181566
10338.0	6557.866	-160.3655	18.1312	64.76	0.71	8301.3	66.04	0.67	8714.5	181780
10340.0	6558.075	-160.2273	18.1930	64.81	0.74	8317.2	66.08	0.70	8730.5	182003
10342.0	6558.293	-160.0887	18.2549	64.86	0.77	8333.3	66.13	0.73	8746.5	182235
10344.0	6558.520	-159.9497	18.3167	64.92	0.80	8349.3	66.17	0.76	8762.6	182476
10346.0	6558.757	-159.8104	18.3786	64.97	0.83	8365.5	66.22	0.79	8778.8	182726
10348.0	6559.003	-159.6707	18.4404	65.02	0.86	8381.6	66.27	0.82	8795.0	182986
10350.0	6559.259	-159.5306	18.5022	65.07	0.89	8397.9	66.32	0.85	8811.2	183256
10352.0	6559.525	-159.3901	18.5641	65.12	0.92	8414.2	66.36	0.88	8827.5	183536
10354.0	6559.801	-159.2492	18.6259	65.18	0.96	8430.5	66.41	0.91	8843.9	183826
10356.0	6560.088	-159.1080	18.6877	65.23	0.99	8446.9	66.46	0.94	8860.3	184127
10358.0	6560.385	-158.9664	18.7495	65.28	1.02	8463.4	66.51	0.98	8876.8	184439
10360.0	6560.694	-158.8244	18.8113	65.34	1.06	8479.9	66.56	1.01	8893.4	184761
10362.0	6561.013	-158.6821	18.8731	65.39	1.10	8496.5	66.60	1.04	8910.0	185094
10364.0	6561.344	-158.5393	18.9349	65.45	1.13	8513.1	66.65	1.08	8926.6	185439
10366.0	6561.686	-158.3962	18.9966	65.50	1.17	8529.8	66.70	1.12	8943.3	185796
10368.0	6562.040	-158.2527	19.0584	65.56	1.21	8546.5	66.75	1.15	8960.1	186164
10370.0	6562.406	-158.1088	19.1201	65.61	1.25	8563.3	66.80	1.19	8977.0	186544
10372.0	6562.785	-157.9645	19.1818	65.67	1.28	8580.2	66.85	1.23	8993.9	186937
10374.0	6563.179	-157.8198	19.2435	65.72	1.32	8597.1	66.90	1.26	9010.8	187343
10376.0	6563.579	-157.6747	19.3052	65.78	1.36	8614.1	66.95	1.30	9027.8	187761
10378.0	6563.996	-157.5292	19.3669	65.83	1.41	8631.1	67.01	1.34	9044.9	188192
10380.0	6564.426	-157.3833	19.4286	65.89	1.45	8648.2	67.06	1.38	9062.0	188636
10382.0	6564.869	-157.2371	19.4902	65.95	1.49	8665.4	67.11	1.42	9079.2	189094
10384.0	6565.326	-157.0904	19.5518	66.01	1.53	8682.6	67.16	1.46	9096.5	189566
10386.0	6565.798	-156.9433	19.6134	66.06	1.58	8699.9	67.21	1.50	9113.8	190052
10388.0	6566.283	-156.7958	19.6750	66.12	1.62	8717.2	67.27	1.55	9131.2	190552
10390.0	6566.783	-156.6480	19.7365	66.18	1.66	8734.6	67.32	1.59	9148.6	191066
10392.0	6567.297	-156.4997	19.7981	66.24	1.71	8752.1	67.37	1.63	9166.1	191595
10394.0	6567.827	-156.3510	19.8595	66.30	1.75	8769.6	67.43	1.68	9183.7	192139
10396.0	6568.371	-156.2019	19.9210	66.35	1.80	8787.2	67.48	1.72	9201.3	192699
10398.0	6568.932	-156.0524	19.9825	66.41	1.85	8804.8	67.53	1.77	9219.0	193274
10400.0	6569.507	-155.9025	20.0439	66.47	1.90	8822.6	67.59	1.81	9236.7	193864
10402.0	6570.099	-155.7522	20.1052	66.53	1.94	8840.3	67.64	1.86	9254.5	194471
10404.0	6570.707	-155.6015	20.1666	66.59	1.99	8858.2	67.70	1.90	9272.4	195094
10406.0	6571.332	-155.4503	20.2279	66.65	2.04	8876.1	67.75	1.95	9290.4	195733
10408.0	6571.973	-155.2987	20.2892	66.72	2.09	8894.1	67.81	2.00	9308.4	196390
10410.0	6572.631	-155.1468	20.3504	66.78	2.14	8912.1	67.87	2.05	9326.5	197063
10412.0	6573.307	-154.9944	20.4116	66.84	2.20	8930.2	67.92	2.10	9344.6	197753
10414.0	6574.000	-154.8416	20.4728	66.90	2.25	8948.4	67.98	2.15	9362.8	198461

TABLE B-VII. GEOGRAPHIC POLAR COORDINATES - SECOND BURN AND TRANSILUNAR PHASES (CONT.)

TIME SEC	GC DIST KM	LONG DEG E	GC LAT DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	ALTITUDE M
10416.0	6574.711	-154.6883	20.5339	66.96	2.30	8966.6	68.04	2.20	9381.1	199187
10418.0	6575.440	-154.5347	20.5950	67.02	2.35	8985.0	68.09	2.25	9399.5	199932
10420.0	6576.187	-154.3806	20.6561	67.09	2.41	9003.4	68.15	2.30	9417.9	200694
10422.0	6576.953	-154.2261	20.7171	67.15	2.46	9021.8	68.21	2.35	9436.4	201475
10424.0	6577.738	-154.0711	20.7781	67.21	2.52	9040.3	68.27	2.41	9455.0	202275
10426.0	6578.542	-153.9158	20.8390	67.28	2.57	9058.9	68.32	2.46	9473.6	203094
10428.0	6579.366	-153.7600	20.8998	67.34	2.63	9077.6	68.38	2.52	9492.4	203933
10430.0	6580.209	-153.6037	20.9607	67.40	2.69	9096.4	68.44	2.57	9511.2	204791
10432.0	6581.072	-153.4471	21.0214	67.47	2.75	9115.2	68.50	2.63	9530.0	205670
10434.0	6581.956	-153.2900	21.0822	67.53	2.80	9134.0	68.56	2.68	9549.0	206568
10436.0	6582.860	-153.1325	21.1428	67.60	2.86	9153.0	68.62	2.74	9568.0	207488
10438.0	6583.785	-152.9745	21.2034	67.66	2.92	9172.1	68.68	2.80	9587.1	208428
10440.0	6584.731	-152.8161	21.2640	67.73	2.98	9191.2	68.74	2.85	9606.2	209389
10442.0	6585.698	-152.6573	21.3245	67.80	3.04	9210.4	68.80	2.91	9625.5	210372
10444.0	6586.687	-152.4980	21.3850	67.86	3.11	9229.6	68.87	2.97	9644.8	211376
10446.0	6587.698	-152.3383	21.4453	67.93	3.17	9248.9	68.93	3.03	9664.2	212403
10448.0	6588.731	-152.1781	21.5057	68.00	3.23	9268.3	68.99	3.09	9683.6	213451
10450.0	6589.787	-152.0175	21.5659	68.06	3.29	9287.8	69.05	3.15	9703.2	214522
10452.0	6590.865	-151.8565	21.6261	68.13	3.36	9307.4	69.11	3.21	9722.8	215616
10454.0	6591.967	-151.6950	21.6863	68.20	3.42	9327.0	69.18	3.28	9742.5	216733
10456.0	6593.092	-151.5330	21.7463	68.27	3.49	9346.8	69.24	3.34	9762.3	217874
10458.0	6594.241	-151.3706	21.8063	68.34	3.55	9366.6	69.30	3.40	9782.1	219038
10460.0	6595.413	-151.2078	21.8663	68.41	3.62	9386.5	69.37	3.46	9802.1	220226
10462.0	6596.610	-151.0445	21.9261	68.48	3.69	9406.5	69.43	3.53	9822.2	221439
10464.0	6597.832	-150.8807	21.9859	68.55	3.75	9426.6	69.50	3.59	9842.3	222676
10466.0	6599.078	-150.7165	22.0456	68.62	3.82	9446.8	69.56	3.66	9862.6	223938
10468.0	6600.350	-150.5519	22.1053	68.69	3.89	9467.1	69.63	3.73	9882.9	225225
10470.0	6601.647	-150.3867	22.1649	68.76	3.96	9487.5	69.69	3.79	9903.4	226537
10472.0	6602.969	-150.2212	22.2243	68.83	4.03	9508.0	69.76	3.86	9924.0	227876
10474.0	6604.318	-150.0551	22.2837	68.90	4.10	9528.6	69.83	3.93	9944.6	229240
10476.0	6605.693	-149.8886	22.3431	68.97	4.17	9549.3	69.89	3.99	9965.4	230631
10478.0	6607.095	-149.7217	22.4023	69.04	4.24	9570.0	69.96	4.06	9986.2	232048
10480.0	6608.524	-149.5542	22.4615	69.12	4.31	9590.9	70.03	4.13	10007.1	233493
10482.0	6609.980	-149.3863	22.5205	69.19	4.39	9611.8	70.10	4.20	10028.1	234964
10484.0	6611.464	-149.2180	22.5795	69.26	4.46	9632.8	70.16	4.27	10049.2	236464
10486.0	6612.975	-149.0492	22.6384	69.34	4.53	9653.9	70.23	4.34	10070.3	237991
10488.0	6614.515	-148.8799	22.6972	69.41	4.61	9675.2	70.30	4.42	10091.6	239546
10490.0	6616.083	-148.7101	22.7559	69.48	4.68	9696.5	70.37	4.49	10113.0	241130
10492.0	6617.680	-148.5399	22.8145	69.56	4.76	9717.9	70.44	4.56	10134.6	242743
10494.0	6619.306	-148.3692	22.8731	69.63	4.83	9739.5	70.51	4.63	10156.2	244385
10496.0	6620.962	-148.1980	22.9315	69.71	4.91	9761.1	70.58	4.71	10177.9	246056
10498.0	6622.647	-148.0263	22.9898	69.79	4.98	9782.9	70.65	4.78	10199.7	247756
10500.0	6624.362	-147.8542	23.0480	69.86	5.06	9804.7	70.72	4.85	10221.6	249487

TABLE B-VII. GEOGRAPHIC POLAR COORDINATES - SECOND BURN AND TRANSUNAR PHASES (CONT.)

TIME SEC	GC DIST KM	LONG DEG E	GC LAT DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	ALTITUDE M
10502.0	6626.107	-147.6815	23.1061	69.94	5.14	9826.7	70.79	4.93	10243.7	251248
10504.0	6627.883	-147.5085	23.1641	70.02	5.22	9848.8	70.87	5.00	10265.8	253040
10506.0	6629.689	-147.3349	23.2220	70.09	5.30	9870.9	70.94	5.08	10288.0	254862
10508.0	6631.527	-147.1608	23.2798	70.17	5.37	9893.1	71.01	5.16	10310.3	256715
10510.0	6633.396	-146.9863	23.3375	70.25	5.45	9915.5	71.08	5.23	10332.7	258600
10512.0	6635.297	-146.8113	23.3951	70.33	5.53	9937.9	71.16	5.31	10355.3	260516
10514.0	6637.229	-146.6358	23.4525	70.40	5.61	9960.4	71.23	5.39	10377.9	262465
10516.0	6639.194	-146.4598	23.5099	70.48	5.69	9983.1	71.30	5.46	10400.6	264445
10518.0	6641.192	-146.2833	23.5671	70.56	5.78	10005.9	71.38	5.54	10423.5	266458
10520.0	6643.222	-146.1063	23.6242	70.64	5.86	10028.8	71.45	5.62	10446.5	268504
10522.0	6645.285	-145.9289	23.6812	70.72	5.94	10051.8	71.53	5.70	10469.6	270583
10524.0	6647.381	-145.7509	23.7380	70.80	6.02	10075.0	71.60	5.78	10492.8	272695
10526.0	6649.512	-145.5725	23.7947	70.88	6.10	10098.3	71.68	5.86	10516.2	274841
10528.0	6651.676	-145.3935	23.8513	70.97	6.18	10121.7	71.76	5.94	10539.7	277021
10530.0	6653.873	-145.2141	23.9078	71.05	6.26	10145.2	71.83	6.02	10563.3	279234
10532.0	6656.104	-145.0342	23.9642	71.13	6.34	10168.8	71.91	6.09	10587.0	281480
10534.0	6658.368	-144.8538	24.0204	71.21	6.42	10192.5	71.99	6.17	10610.8	283760
10536.0	6660.666	-144.6728	24.0764	71.29	6.50	10216.4	72.07	6.25	10634.8	286073
10538.0	6662.997	-144.4914	24.1324	71.38	6.59	10240.5	72.14	6.33	10658.9	288420
10540.0	6665.364	-144.3095	24.1882	71.46	6.67	10264.6	72.22	6.41	10683.2	290803
10542.0	6667.766	-144.1271	24.2438	71.55	6.75	10288.9	72.30	6.49	10707.6	293220
10544.0	6670.203	-143.9441	24.2993	71.63	6.84	10313.3	72.38	6.57	10732.1	295673
10546.0	6672.677	-143.7607	24.3547	71.71	6.92	10337.9	72.46	6.65	10756.8	298162
10548.0	6675.188	-143.5768	24.4099	71.80	7.01	10362.6	72.54	6.74	10781.5	300689
10550.0	6677.735	-143.3923	24.4650	71.88	7.10	10387.4	72.62	6.82	10806.5	303252
10552.0	6680.321	-143.2074	24.5199	71.97	7.19	10412.4	72.70	6.91	10831.5	305853
S-IVB 2ND GUIDANCE CUTOFF										
10553.610	6682.430	-143.0581	24.5640	72.04	7.26	10432.6	72.77	6.98	10851.8	307975
10554.0	6682.945	-143.0219	24.5747	72.06	7.27	10435.4	72.78	6.99	10854.6	308493
10556.0	6685.605	-142.8362	24.6292	72.14	7.37	10433.8	72.86	7.08	10853.1	311168
10558.0	6688.298	-142.6505	24.6835	72.22	7.46	10431.5	72.94	7.17	10850.9	313877
10560.0	6691.025	-142.4648	24.7374	72.31	7.56	10429.1	73.03	7.27	10848.6	316619
10562.0	6693.786	-142.2790	24.7911	72.39	7.65	10426.8	73.11	7.36	10846.3	319395
TRANSUNAR INJECTION (TLI)										
10563.610	6696.033	-142.1295	24.8341	72.46	7.73	10424.8	73.17	7.43	10844.5	321654
10600.0	6751.088	-138.7523	25.7497	74.04	9.42	10378.7	74.69	9.05	10800.2	376974
10550.0	6845.991	-134.1330	26.8484	76.26	11.73	10299.6	76.84	11.26	10724.1	472204
10700.0	6960.008	-129.5753	27.7544	78.53	13.97	10206.6	79.03	13.39	10634.7	586497
10750.0	7091.883	-125.1141	28.4715	80.82	16.13	10101.9	81.23	15.46	10534.0	718595

TABLE B-VII. GEOGRAPHIC POLAR COORDINATES - SECOND BURN AND TRANSUNAR PHASES (CONT.)

TIME SEC	GC DIST KM	LONG DEG E	GC LAT DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	ALTITUDE M
10800.0	7240.273	-120.7804	29.0086	83.10	18.23	9987.4	83.42	17.44	10424.0	867155
10850.0	7403.795	-116.6001	29.3783	85.34	20.24	9865.3	85.56	19.34	10306.6	1030794
10900.0	7581.070	-112.5930	29.5963	87.52	22.17	9737.2	87.64	21.15	10183.6	1208139
10950.0	7770.752	-108.7733	29.6795	89.62	24.02	9605.1	89.64	22.87	10056.8	1397849
11000.0	7971.556	-105.1492	29.6455	91.63	25.78	9470.2	91.54	24.51	9927.4	1598641
11050.0	8182.268	-101.7242	29.5112	93.54	27.47	9334.0	93.33	26.07	9796.8	1809310
11100.0	8401.760	-98.4973	29.2926	95.35	29.08	9197.5	95.02	27.55	9666.0	2028732
11150.0	8628.994	-95.4646	29.0044	97.07	30.62	9061.6	96.60	28.95	9535.9	2255874
11200.0	8863.021	-92.6195	28.6598	98.68	32.09	8927.0	98.07	30.28	9407.1	2489792
11250.0	9102.983	-89.9536	28.2703	100.20	33.50	8794.4	99.45	31.53	9280.2	2729632
11300.0	9348.106	-87.4578	27.8457	101.62	34.84	8664.0	100.72	32.72	9155.6	2974624
11350.0	9597.696	-85.1220	27.3947	102.97	36.12	8536.4	101.90	33.85	9033.7	3224075
11400.0	9851.132	-82.9363	26.9243	104.23	37.35	8411.8	103.00	34.92	8914.6	3477368
11450.0	10107.860	-80.8906	26.4405	105.42	38.53	8290.2	104.01	35.94	8798.6	3733951
11500.0	10367.385	-78.9753	25.9483	106.54	39.66	8171.8	104.95	36.90	8685.6	3993330
11550.0	10629.271	-77.1811	25.4517	107.61	40.75	8056.7	105.82	37.82	8575.8	4255071
11600.0	10893.132	-75.4993	24.9540	108.62	41.79	7945.0	106.62	38.69	8459.2	4518788
11650.0	11158.623	-73.9217	24.4579	109.57	42.80	7836.5	107.37	39.52	8365.7	4784138
11700.0	11425.441	-72.4406	23.9655	110.49	43.77	7731.3	108.06	40.32	8265.4	5050818
11750.0	11693.317	-71.0491	23.4785	111.36	44.70	7629.3	108.71	41.07	8168.1	5318559
11800.0	11962.012	-69.7405	22.9981	112.20	45.60	7530.5	109.31	41.79	8073.8	5587123
11850.0	12231.315	-68.5089	22.5255	113.00	46.48	7434.7	109.86	42.48	7982.4	5856301
11900.0	12501.043	-67.3187	22.0613	113.77	47.32	7341.9	110.38	43.14	7893.8	6125906
11950.0	12771.029	-66.2549	21.6061	114.52	48.14	7252.0	110.87	43.77	7808.0	6395775
12000.0	13041.129	-65.2228	21.1603	115.25	48.94	7164.8	111.32	44.37	7724.7	6665762
12050.0	13311.215	-64.2482	20.7241	115.96	49.71	7080.4	111.75	44.95	7644.0	6935739
12100.0	13581.173	-63.3271	20.2977	116.65	50.46	6998.6	112.14	45.51	7565.8	7205592
12147.200	13835.791	-62.5034	19.9041	117.29	51.15	6923.6	112.49	46.01	7494.0	7460114

CSM SEPARATION

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APPENDIX C

TIME HISTORY OF TRAJECTORY PARAMETERS - ENGLISH UNITS

The postflight trajectory, from guidance reference release to CSM separation, is tabulated in English Units in Table C-I through C-VII.

Table C-I gives the earth-fixed launch site position, velocity, and acceleration components for the ascent phase of flight.

Table C-II gives the launch vehicle navigation position, velocity, and acceleration components for the ascent phase of flight.

Table C-III gives the geographic polar coordinates for the ascent phase of flight.

Table C-IV gives the geographic polar coordinates for the parking orbit phase of flight.

Table C-V gives the earth-fixed launch site position, velocity, and acceleration components for the second burn and translunar phases of flight.

Table C-VI gives the launch vehicle navigation position, velocity, and acceleration components for the second burn and translunar phases of flight.

Table C-VII gives the geographic polar coordinates for the second burn and translunar phases of flight.

TABLE C-I. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S	DDXE FT/S <sup>2</sup>	DDYE FT/S <sup>2</sup>	DDZE FT/S <sup>2</sup>
GUIDANCE REFERENCE RELEASE									
-16.939	366	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-16.0	366	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-15.0	366	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-14.0	366	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-13.0	366	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-12.0	366	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-11.0	366	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-10.0	366	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-9.0	366	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-8.0	366	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-7.0	366	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-6.0	366	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-5.0	366	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-4.0	366	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-3.0	366	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-2.0	366	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-1.0	366	0	0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	366	0	0	0.0	0.0	0.0	0.0	0.0	0.0
ALL HOLDOWN ARMS RELEASED									
0.300	366	0	0	0.5	-0.0	-0.0	2.68	-0.01	-0.01
LIFTOFF - START OF TIME BASE 1									
0.600	367	0	0	1.5	-0.0	-0.0	3.67	0.01	-0.01
1.0	368	0	0	3.7	0.0	-0.0	7.36	0.08	-0.10
2.0	375	0	0	11.3	0.2	-0.2	7.66	0.19	-0.09
3.0	390	0	0	19.1	0.4	-0.3	7.84	0.24	-0.11
4.0	414	1	-1	27.1	0.7	-0.4	8.03	0.36	-0.10
5.0	445	2	-1	35.2	1.0	-0.5	8.24	0.39	-0.11
6.0	484	3	-2	43.5	1.4	-0.6	8.39	0.46	-0.12
7.0	532	5	-2	52.0	2.0	-0.7	8.61	0.88	-0.23
8.0	588	7	-3	60.7	3.0	-1.0	8.82	1.02	-0.22
9.0	653	11	-4	69.7	4.0	-1.1	9.15	0.88	-0.15
10.0	728	15	-5	79.0	4.6	-1.3	9.40	0.52	-0.07
11.0	811	20	-7	88.6	5.0	-1.3	9.67	0.23	0.04
12.0	905	25	-8	98.3	5.2	-1.2	9.85	0.20	0.13
13.0	1008	30	-9	108.2	5.5	-1.0	9.89	0.29	0.21
14.0	1121	36	-10	118.2	5.8	-0.7	10.04	0.32	0.29

TABLE C-1. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S	DDXE FT/S SQ	DDYE FT/S SQ	DDZE FT/S SQ
15.0	1245	42	-10	128.3	6.0	-0.4	10.27	0.21	0.32
16.0	1378	48	-11	138.7	6.1	-0.1	10.54	-0.06	0.38
17.0	1522	54	-11	149.4	5.9	0.3	10.74	-0.28	0.44
18.0	1677	60	-10	160.2	5.6	0.8	10.94	-0.31	0.57
19.0	1843	65	-9	171.3	5.4	1.4	11.19	-0.22	0.70
20.0	2020	70	-7	182.6	5.2	2.2	11.43	-0.16	0.74
21.0	2208	75	-5	194.1	5.0	2.9	11.67	-0.11	0.87
22.0	2408	80	-1	205.9	4.8	3.9	11.92	-0.12	1.01
23.0	2620	85	3	218.0	4.7	5.0	12.16	-0.11	1.16
24.0	2844	90	9	230.2	4.6	6.2	12.40	-0.14	1.34
25.0	3080	94	16	242.8	4.4	7.7	12.64	-0.17	1.55
26.0	3329	99	24	255.5	4.3	9.3	12.89	-0.19	1.80
27.0	3591	103	35	268.5	4.1	11.3	13.14	-0.19	2.07
28.0	3867	107	47	281.8	3.9	13.5	13.40	-0.18	2.35
29.0	4155	111	62	295.4	3.7	16.0	13.67	-0.18	2.64
30.0	4457	114	79	309.2	3.5	18.8	13.94	-0.19	2.95
31.0	4774	118	99	323.2	3.3	21.9	14.21	-0.21	3.29
32.0	5104	121	123	337.6	3.1	25.4	14.48	-0.23	3.64
33.0	5449	124	150	352.2	2.9	29.2	14.74	-0.24	4.03
34.0	5808	127	181	367.1	2.6	33.4	15.02	-0.24	4.43
35.0	6183	129	217	382.2	2.4	38.0	15.29	-0.23	4.84
36.0	6573	131	258	397.7	2.2	43.1	15.57	-0.22	5.26
37.0	6978	134	303	413.4	2.0	48.6	15.84	-0.20	5.71
38.0	7400	135	355	429.3	1.8	54.5	16.10	-0.20	6.19
39.0	7837	137	413	445.6	1.6	61.0	16.37	-0.19	6.69
40.0	8291	139	477	462.1	1.4	67.9	16.63	-0.21	7.21
41.0	8761	140	549	478.8	1.1	75.4	16.90	-0.22	7.75
42.0	9249	141	628	495.9	0.9	83.4	17.17	-0.23	8.32
43.0	9753	142	716	513.2	0.7	92.0	17.43	-0.24	8.91
44.0	10275	142	812	530.7	0.4	101.2	17.68	-0.25	9.53
45.0	10815	143	918	548.5	0.2	111.1	17.93	-0.25	10.15
46.0	11372	143	1034	566.6	-0.1	121.6	18.16	-0.25	10.79
47.0	11948	142	1162	584.8	-0.3	132.7	18.39	-0.23	11.45
48.0	12542	142	1300	603.3	-0.5	144.4	18.61	-0.20	12.12
49.0	13155	141	1451	622.1	-0.7	156.9	18.83	-0.16	12.79
50.0	13786	141	1614	641.0	-0.8	170.0	19.08	-0.11	13.47
51.0	14437	140	1791	660.2	-0.9	183.8	19.32	-0.06	14.17
52.0	15107	139	1982	679.7	-0.9	198.4	19.55	-0.00	14.89
53.0	15796	138	2188	699.3	-0.9	213.6	19.78	0.03	15.62
54.0	16506	137	2409	719.2	-0.9	229.6	19.97	0.05	16.38
55.0	17235	136	2647	739.3	-0.8	246.4	20.16	0.05	17.15
56.0	17984	135	2903	759.5	-0.8	263.9	20.35	0.04	17.91
57.0	18754	135	3176	780.0	-0.7	282.2	20.52	0.03	18.68



TABLE C-1. EARTH-FIXED LAUNCH-SITE POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S	DDXE FT/S SQ	DDYE FT/S SQ	DDZE FT/S SQ
58.0	19544	134	3467	800.6	-0.7	301.3	20.70	0.01	19.44
59.0	20355	133	3778	821.3	-0.8	321.1	20.84	-0.07	20.25
60.0	21187	132	4110	842.2	-0.9	341.8	20.98	-0.11	21.02
61.0	22040	131	4462	863.3	-1.0	363.2	21.08	-0.16	21.79
62.0	22913	130	4836	884.4	-1.2	385.3	21.15	-0.19	22.53
63.0	23808	129	5233	905.5	-1.3	408.2	21.20	-0.18	23.26
64.0	24725	128	5653	926.8	-1.5	431.8	21.23	-0.12	23.98
MACH 1									
65.000	25662	126	6097	948.0	-1.5	456.1	21.25	-0.04	24.69
66.0	26621	125	6566	969.3	-1.5	481.2	21.29	0.03	25.41
67.0	27601	123	7060	990.6	-1.5	507.0	21.34	0.11	26.14
68.0	28602	122	7580	1012.0	-1.4	533.5	21.44	0.14	26.92
69.0	29625	120	8127	1033.5	-1.3	560.9	21.57	0.14	27.75
70.0	30669	119	8702	1055.2	-1.1	589.1	21.74	0.11	28.60
71.0	31735	118	9305	1077.0	-1.0	618.1	21.95	0.06	29.44
72.0	32823	117	9938	1099.1	-1.0	647.9	22.20	0.03	30.28
73.0	33933	116	10601	1121.4	-1.0	678.6	22.48	-0.01	31.07
74.0	35066	115	11296	1144.1	-1.0	710.0	22.74	0.05	31.88
75.0	36221	114	12022	1166.9	-0.9	742.3	22.98	0.12	32.66
76.0	37400	113	12780	1190.0	-0.9	775.3	23.21	0.12	33.45
77.0	38601	113	13573	1213.3	-0.7	809.2	23.40	0.24	34.26
78.0	39826	112	14399	1236.8	-0.3	843.9	23.55	0.40	35.11
79.0	41075	112	15261	1260.4	0.2	879.5	23.70	0.57	36.04
80.0	42347	112	16158	1284.2	0.8	916.0	23.82	0.74	37.08
81.0	43643	114	17093	1308.0	1.6	953.7	23.89	0.84	38.20
MAXIMUM DYNAMIC PRESSURE									
82.000	44963	116	18066	1331.9	2.4	992.5	23.93	0.85	39.40
83.0	46307	118	19079	1355.8	3.2	1032.6	23.93	0.80	40.70
84.0	47675	122	20132	1379.7	3.9	1073.9	23.87	0.66	42.04
85.0	49067	126	21227	1403.5	4.5	1116.7	23.78	0.51	43.39
86.0	50482	131	22365	1427.3	5.0	1160.7	23.68	0.37	44.70
87.0	51921	136	23549	1450.9	5.3	1206.0	23.58	0.25	45.97
88.0	53384	141	24778	1474.5	5.5	1252.5	23.54	0.18	47.15
89.0	54870	147	26054	1498.1	5.7	1300.2	23.57	0.14	48.28
90.0	56380	153	27379	1521.7	5.8	1349.1	23.65	0.14	49.35
91.0	57914	159	28753	1545.4	6.0	1398.9	23.78	0.15	50.39
92.0	59471	165	30177	1569.3	6.1	1449.8	23.92	0.15	51.39
93.0	61052	171	31652	1593.2	6.3	1501.7	24.07	0.14	52.38
94.0	62658	177	33181	1617.4	6.4	1554.6	24.22	0.09	53.36

TABLE C-1. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S	DDXE FT/S SQ	DDYE FT/S SQ	DDZE FT/S SQ
95.0	64287	184	34762	1641.6	6.4	1608.4	24.34	0.02	54.36
96.0	65941	190	36398	1666.0	6.4	1663.3	24.44	-0.06	55.37
97.0	67619	196	38089	1690.5	6.3	1719.2	24.50	-0.16	56.43
98.0	69322	203	39837	1715.0	6.1	1776.2	24.56	-0.23	57.52
99.0	71049	209	41642	1739.6	5.9	1834.3	24.61	-0.28	58.63
100.0	72801	214	43505	1764.2	5.6	1893.5	24.65	-0.27	59.76
101.0	74578	220	45429	1788.9	5.4	1953.8	24.69	-0.19	60.89
102.0	76379	225	47413	1813.6	5.2	2015.3	24.73	-0.09	62.01
103.0	78205	230	49460	1838.4	5.2	2077.8	24.77	0.05	63.12
104.0	80056	236	51569	1863.2	5.3	2141.5	24.84	0.18	64.19
105.0	81931	241	53743	1888.0	5.6	2206.2	24.90	0.28	65.24
106.0	83832	247	55982	1913.0	5.9	2271.9	24.98	0.35	66.28
107.0	85757	253	58287	1938.0	6.2	2338.7	25.10	0.37	67.31
108.0	87708	259	60660	1963.2	6.6	2406.6	25.25	0.36	68.35
109.0	89684	266	63101	1988.6	6.9	2475.4	25.46	0.32	69.39
110.0	91685	273	65511	2014.2	7.2	2545.3	25.69	0.25	70.42
111.0	93712	280	68192	2040.0	7.4	2616.3	25.95	0.20	71.45
112.0	95765	288	70844	2066.1	7.6	2688.2	26.18	0.18	72.50
113.0	97844	295	73569	2092.3	7.8	2761.2	26.39	0.19	73.56
114.0	99950	303	76367	2118.8	8.0	2835.4	26.54	0.23	74.66
115.0	102082	312	79240	2145.3	8.3	2910.6	26.63	0.28	75.82
116.0	104241	320	82188	2172.0	8.6	2987.0	26.65	0.33	77.03
117.0	106426	329	85214	2198.6	8.9	3064.7	26.63	0.35	78.30
118.0	108638	338	88318	2225.2	9.3	3143.7	26.60	0.33	79.63
119.0	110876	347	91502	2251.8	9.5	3224.0	26.55	0.29	81.00
120.0	113141	357	94767	2278.3	9.8	3305.7	26.53	0.22	82.41
121.0	115433	367	98114	2304.9	10.0	3388.8	26.52	0.17	83.74
122.0	117751	377	101545	2331.4	10.2	3473.3	26.56	0.12	85.14
123.0	120096	387	105061	2358.0	10.3	3559.3	26.61	0.09	86.55
124.0	122467	398	108664	2384.7	10.4	3646.6	26.70	0.09	87.96
125.0	124865	408	112355	2411.4	10.5	3735.3	26.84	0.10	89.37
126.0	127290	418	116135	2438.4	10.6	3825.4	27.00	0.13	90.78
127.0	129742	429	120006	2465.5	10.7	3917.0	27.19	0.16	92.18
128.0	132221	440	123969	2492.7	10.9	4009.9	27.40	0.10	93.61
129.0	134728	451	128027	2520.2	11.0	4104.3	27.62	0.28	95.08
130.0	137262	462	132178	2547.9	11.3	4200.1	27.83	0.28	96.56
131.0	139824	473	136427	2575.9	11.6	4297.4	28.05	0.22	98.03
132.0	142414	485	140774	2604.0	11.9	4396.2	28.28	0.30	99.53
133.0	145032	497	145220	2632.4	12.1	4496.5	28.51	0.19	101.11
134.0	147679	509	149767	2661.0	12.3	4598.4	28.77	0.16	102.68
135.0	150354	522	154418	2689.9	12.5	4701.8	29.02	0.27	104.26
135.960	S-IC CENTER 152950	ENGINE CUTOFF (ENGINE SOLENOID) 534		2717.9	12.8	4802.7	29.27	0.31	105.78

TABLE C-1. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S	DDXE FT/S SQ	DDYE FT/S SQ	DDZE FT/S SQ
136.0	153059	534	159173	2719.1	12.8	4806.9	29.28	0.31	105.84
137.0	155788	547	164027	2740.0	13.0	4898.9	17.54	0.20	85.93
138.0	158534	560	168964	2757.6	13.2	4984.8	17.61	0.18	85.81
139.0	161301	574	173994	2775.3	13.5	5070.9	17.76	0.35	86.48
140.0	164084	587	179108	2793.1	13.8	5157.9	17.95	0.36	87.53
141.0	166884	601	184309	2811.2	14.2	5246.0	18.15	0.40	88.72
142.0	169704	616	189600	2829.4	14.6	5335.4	18.35	0.39	89.99
143.0	172542	631	194979	2847.9	14.9	5426.0	18.55	0.37	91.30
144.0	175398	646	200452	2866.5	15.3	5518.3	18.76	0.36	92.68
145.0	178274	661	206016	2885.4	15.7	5611.6	18.96	0.36	94.02
146.0	181168	677	211675	2904.5	16.0	5706.3	19.17	0.36	95.37
147.0	184082	693	217429	2923.3	16.4	5802.3	19.33	0.38	96.78
148.0	187015	710	223280	2942.7	16.8	5899.8	19.53	0.40	98.16
149.0	189967	727	229229	2962.3	17.2	5998.6	19.72	0.42	99.54
150.0	192939	744	235278	2982.2	17.6	6098.9	19.92	0.44	100.93
151.0	195932	762	241428	3002.2	18.1	6200.5	20.13	0.45	102.31
152.0	198944	780	247680	3022.4	18.5	6303.7	20.38	0.46	103.86
153.0	201977	799	254036	3042.9	19.0	6408.4	20.46	0.45	105.42
154.0	205030	819	260497	3063.5	19.5	6514.6	20.73	0.45	106.97
155.0	208104	838	267065	3084.3	20.0	6622.4	21.00	0.62	108.52
156.0	211199	858	273741	3105.5	20.5	6731.7	21.27	0.44	110.07
157.0	214315	879	280528	3126.9	21.0	6842.5	21.53	0.51	111.62
158.0	217453	901	287426	3148.5	21.6	6955.0	21.80	0.60	113.17
159.0	220613	922	294438	3170.5	22.1	7068.9	22.07	0.53	114.73
S-IC OUTBOARD ENGINE CUTOFF (ENGINE SOLENOID)									
159.560	222390	935	298411	3182.9	22.4	7133.4	22.22	0.58	115.59
160.0	223790	945	301552	3183.1	22.7	7161.9	-21.35	0.54	13.91
161.0	226959	968	308714	3155.5	23.2	7166.3	-31.09	0.44	-1.25
S-IC/S-II SEPARATION COMMAND									
161.200	227589	972	310149	3149.3	23.2	7166.1	-31.03	0.44	-1.24
162.0	230097	991	315877	3124.5	23.6	7165.0	-30.84	0.43	-1.17
164.0	236288	1039	330210	3065.0	24.4	7165.4	-28.28	0.43	6.32
166.0	242369	1089	344566	3016.8	25.3	7192.9	-22.42	0.49	16.23
168.0	248358	1141	358981	2973.1	26.4	7227.0	-20.23	0.56	20.27
170.0	254264	1195	373477	2933.2	27.6	7270.0	-19.91	0.58	21.87
172.0	260091	1251	388061	2893.1	28.8	7312.7	-19.59	0.63	22.28
174.0	265838	1310	402731	2854.1	30.0	7357.5	-19.50	0.64	22.39
176.0	271507	1371	417491	2815.2	31.3	7402.5	-19.44	0.64	22.47
178.0	277099	1435	432341	2776.4	32.6	7447.5	-19.35	0.65	22.58

TABLE C-1. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S	DDXE FT/S SQ	DDYE FT/S SQ	DDZE FT/S SQ
180.0	282613	1502	447281	2737.8	33.9	7492.7	-19.26	0.66	22.66
182.0	288050	1571	462312	2699.4	35.2	7538.2	-19.19	0.66	22.75
184.0	293411	1642	477434	2661.1	36.6	7583.8	-19.12	0.67	22.85
186.0	298695	1717	492647	2622.9	37.9	7629.6	-19.05	0.67	22.95
188.0	303902	1794	507952	2584.9	39.2	7675.6	-18.98	0.68	23.05
190.0	309034	1874	523349	2547.0	40.6	7721.7	-18.89	0.68	23.15
192.0	314091	1957	538839	2509.3	42.0	7768.2	-18.79	0.69	23.25
194.0	319072	2042	554422	2471.8	43.4	7814.8	-18.68	0.71	23.38
196.0	323978	2130	570099	2434.6	44.8	7861.7	-18.58	0.71	23.53
198.0	328810	2221	585869	2397.5	46.2	7908.9	-18.48	0.72	23.67
200.0	333568	2315	601734	2360.7	47.7	7956.3	-18.38	0.72	23.77
202.0	338253	2412	617695	2324.0	49.1	8004.0	-18.36	0.73	23.87
204.0	342864	2511	633750	2287.1	50.6	8051.9	-18.56	0.75	24.06
206.0	347401	2614	649903	2249.5	52.1	8100.3	-18.97	0.79	24.35
208.0	351862	2720	666152	2211.1	53.8	8149.3	-19.49	0.84	24.69
210.0	356245	2829	682500	2171.7	55.5	8199.0	-19.93	0.87	25.00
212.0	360548	2942	698948	2131.6	57.2	8249.2	-20.13	0.88	25.21
214.0	364771	3058	715497	2091.3	59.0	8299.8	-20.15	0.86	25.34
216.0	368913	3178	732148	2051.0	60.7	8350.6	-20.10	0.87	25.44
218.0	372975	3301	748900	2010.9	62.5	8401.5	-20.08	0.90	25.53
220.0	376957	3428	765754	1970.7	64.3	8452.7	-20.09	0.92	25.63
222.0	380858	3558	782711	1930.5	66.1	8504.1	-20.07	0.94	25.74
224.0	384679	3692	799770	1890.4	68.0	8555.7	-20.05	0.94	25.85
226.0	388420	3830	816934	1850.3	69.9	8607.5	-20.03	0.95	25.97
228.0	392080	3972	834201	1810.3	71.8	8659.6	-20.03	0.96	26.09
230.0	395661	4118	851572	1770.2	73.8	8711.9	-20.03	0.97	26.22
232.0	399161	4267	869048	1730.2	75.7	8764.4	-20.01	0.96	26.34
234.0	402581	4420	886630	1690.2	77.6	8817.2	-19.99	0.93	26.46
236.0	405922	4577	904317	1650.2	79.4	8870.3	-19.96	0.91	26.60
238.0	409182	4738	922111	1610.3	81.2	8923.6	-19.96	0.92	26.74
240.0	412363	4902	940012	1570.4	83.1	8977.2	-19.97	0.94	26.85
242.0	415464	5070	958020	1530.4	85.0	9031.0	-19.99	0.95	26.96
244.0	418485	5242	976136	1490.4	86.9	9085.1	-20.00	0.94	27.09
246.0	421426	5418	994361	1450.5	88.8	9139.4	-19.99	0.93	27.24
248.0	424287	5597	1012694	1410.5	90.6	9194.0	-19.99	0.94	27.38
250.0	427068	5780	1031137	1370.5	92.5	9248.9	-19.97	0.95	27.49
252.0	429769	5967	1049690	1330.6	94.4	9304.0	-19.96	0.96	27.61
254.0	432390	6158	1068353	1290.7	96.3	9359.4	-19.96	0.97	27.74
256.0	434931	6353	1087128	1250.7	98.3	9414.9	-19.96	0.97	27.86
258.0	437393	6551	1106013	1210.8	100.2	9470.8	-19.97	0.98	27.98
260.0	439775	6754	1125011	1170.9	102.2	9526.9	-19.97	0.99	28.11
262.0	442076	6960	1144121	1130.9	104.2	9583.2	-19.96	1.00	28.26
264.0	444298	7170	1163344	1091.0	106.2	9639.9	-19.94	1.01	28.41

TABLE C-1. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S	DDXE FT/S SQ	DDYE FT/S SQ	DDZE FT/S SQ
266.0	446441	7385	1182681	1051.1	108.2	9696.9	-19.95	1.01	28.54
268.0	448503	7603	1202132	1011.2	110.3	9754.1	-19.95	1.02	28.66
270.0	450486	7826	1221697	971.4	112.3	9811.5	-19.94	1.03	28.80
272.0	452388	8053	1241378	931.5	114.4	9869.3	-19.94	1.04	28.94
274.0	454212	8284	1261175	891.6	116.5	9927.3	-19.95	1.04	29.09
276.0	455955	8519	1281087	851.7	118.6	9985.6	-19.98	1.03	29.24
278.0	457618	8758	1301117	811.7	120.6	10044.3	-20.00	1.03	29.38
280.0	459201	9001	1321265	771.7	122.7	10103.2	-19.98	1.05	29.54
282.0	460705	9249	1341530	731.7	124.8	10162.4	-19.97	1.07	29.69
284.0	462128	9500	1361915	691.8	127.0	10221.9	-19.97	1.06	29.82
286.0	463472	9756	1382418	651.8	129.1	10281.7	-19.99	1.06	29.97
288.0	464736	10017	1403042	611.8	131.3	10341.8	-20.01	1.09	30.12
290.0	465919	10282	1423786	571.8	133.4	10402.2	-20.03	1.10	30.29
292.0	467023	10551	1444651	531.7	135.6	10463.0	-20.05	1.10	30.45
294.0	468046	10824	1465638	491.6	137.8	10524.0	-20.06	1.11	30.60
296.0	468989	11102	1486747	451.5	140.1	10585.4	-20.06	1.13	30.77
298.0	469852	11384	1507980	411.4	142.3	10647.1	-20.05	1.14	30.92
300.0	470635	11671	1529336	371.3	144.6	10709.1	-20.06	1.13	31.09
302.0	471337	11963	1550816	331.1	146.9	10771.4	-20.08	1.14	31.24
304.0	471959	12259	1572421	291.0	149.2	10834.1	-20.11	1.15	31.41
306.0	472501	12560	1594153	250.7	151.5	10897.0	-20.12	1.16	31.58
308.0	472962	12865	1616010	210.5	153.8	10960.4	-20.12	1.18	31.75
310.0	473343	13175	1637994	170.2	156.2	11024.0	-20.13	1.20	31.92
312.0	473643	13490	1660106	129.9	158.6	11088.0	-20.16	1.20	32.08
314.0	473863	13809	1682347	89.6	161.0	11152.4	-20.18	1.19	32.25
316.0	474002	14134	1704716	49.2	163.4	11217.1	-20.19	1.22	32.44
318.0	474060	14463	1727215	8.8	165.8	11282.1	-20.22	1.23	32.62
320.0	474037	14797	1749845	-31.6	168.3	11347.5	-20.26	1.23	32.81
322.0	473933	15136	1772606	-72.2	170.8	11413.3	-20.27	1.24	32.98
324.0	473748	15480	1795498	-112.7	173.3	11479.5	-20.28	1.24	33.15
326.0	473482	15829	1818524	-153.3	175.8	11545.9	-20.31	1.26	33.33
328.0	473135	16183	1841682	-194.0	178.3	11612.8	-20.34	1.27	33.54
330.0	472706	16543	1864975	-234.7	180.8	11680.1	-20.36	1.28	33.73
332.0	472196	16907	1888403	-275.4	183.4	11747.7	-20.36	1.29	33.91
334.0	471605	17276	1911966	-316.1	186.0	11815.7	-20.38	1.30	34.09
336.0	470932	17651	1935666	-356.9	188.6	11884.1	-20.43	1.31	34.30
338.0	470177	18031	1959503	-397.8	191.2	11952.9	-20.47	1.32	34.52
340.0	469340	18416	1983478	-438.8	193.9	12022.2	-20.50	1.34	34.71
342.0	468422	18806	2007592	-479.8	196.6	12091.8	-20.53	1.36	34.90
344.0	467421	19202	2031846	-520.9	199.3	12161.8	-20.55	1.36	35.10
346.0	466338	19604	2056240	-562.1	202.0	12232.2	-20.60	1.38	35.31
348.0	465173	20010	2080775	-603.3	204.8	12303.1	-20.64	1.38	35.54
350.0	463925	20423	2105452	-644.6	207.6	12374.4	-20.67	1.41	35.75

TABLE C-I. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S	DDXE FT/S SQ	DDYE FT/S SQ	DDZE FT/S SQ
352.0	462594	20841	2130272	-686.0	210.4	12446.1	-20.69	1.43	35.95
354.0	461181	21264	2155237	-727.4	213.3	12518.2	-20.71	1.44	36.16
356.0	459685	21694	2180345	-768.8	216.2	12590.7	-20.73	1.45	36.39
358.0	458106	22129	2205600	-810.3	219.1	12663.7	-20.75	1.46	36.62
360.0	456443	22570	2231001	-851.9	222.0	12737.2	-20.80	1.49	36.84
362.0	454698	23017	2256549	-893.5	225.0	12811.1	-20.86	1.52	37.06
364.0	452869	23470	2282245	-935.3	228.1	12885.4	-20.93	1.53	37.29
366.0	450957	23929	2308091	-977.2	231.1	12960.3	-20.97	1.51	37.53
368.0	448960	24395	2334087	-1019.2	234.1	13035.5	-21.01	1.49	37.76
370.0	446880	24866	2360233	-1061.3	237.1	13111.3	-21.05	1.49	37.98
372.0	444715	25343	2386532	-1103.4	240.1	13187.5	-21.09	1.52	38.23
374.0	442466	25826	2412984	-1145.6	243.2	13264.2	-21.14	1.55	38.48
376.0	440133	26316	2439589	-1188.0	246.3	13341.4	-21.21	1.57	38.73
378.0	437714	26812	2466350	-1230.4	249.5	13419.1	-21.26	1.58	38.99
380.0	435211	27314	2493266	-1273.0	252.6	13497.4	-21.32	1.59	39.24
382.0	432622	27822	2520340	-1315.7	255.8	13576.1	-21.36	1.61	39.49
384.0	429948	28337	2547571	-1358.5	259.1	13655.3	-21.43	1.62	39.75
386.0	427188	28858	2574961	-1401.4	262.3	13735.1	-21.48	1.64	40.02
388.0	424342	29386	2602512	-1444.4	265.6	13815.4	-21.53	1.63	40.29
390.0	421410	29921	2630223	-1487.5	268.8	13896.3	-21.58	1.63	40.56
392.0	418392	30462	2658097	-1530.7	272.1	13977.6	-21.63	1.64	40.81
394.0	415287	31009	2686134	-1574.1	275.4	14059.6	-21.69	1.68	41.09
396.0	412096	31563	2714336	-1617.5	278.8	14142.0	-21.77	1.68	41.39
398.0	408817	32124	2742703	-1661.2	282.1	14225.1	-21.86	1.67	41.68
400.0	405451	32692	2771237	-1704.9	285.5	14308.8	-21.93	1.67	41.97
402.0	401997	33266	2799938	-1748.8	288.8	14393.0	-21.97	1.68	42.25
404.0	398456	33847	2828809	-1792.8	292.2	14477.8	-22.02	1.70	42.53
406.0	394826	34435	2857850	-1837.0	295.6	14563.1	-22.09	1.72	42.82
408.0	391108	35030	2887062	-1881.2	299.1	14649.1	-22.17	1.73	43.13
410.0	387301	35631	2916447	-1925.6	302.5	14735.7	-22.25	1.73	43.46
412.0	383405	36240	2946005	-1970.2	306.0	14822.9	-22.34	1.74	43.79
414.0	379420	36855	2975739	-2015.0	309.5	14910.8	-22.42	1.78	44.09
416.0	375345	37478	3005649	-2059.9	313.1	14999.3	-22.48	1.82	44.39
418.0	371180	38108	3035736	-2104.9	316.8	15088.4	-22.52	1.84	44.71
420.0	366925	38745	3066003	-2150.0	320.4	15178.1	-22.59	1.84	45.05
422.0	362580	39390	3096449	-2195.3	324.1	15268.6	-22.69	1.83	45.40
424.0	358144	40041	3127077	-2240.8	327.8	15359.7	-22.80	1.85	45.73
426.0	353617	40701	3157888	-2286.5	331.5	15451.5	-22.90	1.87	46.07
428.0	348998	41368	3188884	-2332.3	335.3	15544.0	-22.97	1.88	46.43
430.0	344287	42042	3220065	-2378.3	339.0	15637.2	-23.04	1.88	46.79
432.0	339485	42724	3251433	-2424.5	342.8	15731.1	-23.12	1.90	47.13
434.0	334589	43413	3282990	-2470.8	346.7	15825.8	-23.21	1.94	47.47
436.0	329601	44110	3314737	-2517.3	350.6	15921.1	-23.31	1.97	47.85

TABLE C-1. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S	DDXE FT/S <sup>2</sup>	DDYE FT/S <sup>2</sup>	DDZE FT/S <sup>2</sup>
438.0	324520	44815	3346675	-2564.1	354.5	16017.2	-23.42	1.98	48.24
440.0	319345	45528	3378806	-2611.0	358.5	16114.0	-23.52	1.98	48.63
442.0	314076	46249	3411131	-2658.1	362.5	16211.7	-23.61	2.01	49.02
444.0	308712	46978	3443653	-2705.4	366.5	16310.1	-23.69	2.02	49.41
446.0	303254	47715	3476372	-2752.9	370.6	16409.3	-23.78	2.04	49.81
448.0	297701	48461	3509291	-2800.6	374.7	16509.3	-23.88	2.06	50.20
450.0	292052	49214	3542410	-2848.4	378.8	16610.1	-23.98	2.08	50.61
452.0	286307	49976	3575732	-2896.5	383.0	16711.8	-24.08	2.10	51.03
454.0	280466	50746	3609258	-2944.8	387.1	16814.2	-24.21	2.13	51.44
456.0	274528	51525	3642989	-2993.4	391.5	16917.5	-24.34	2.16	51.86
458.0	268493	52312	3676929	-3042.1	395.7	17021.6	-24.43	2.14	52.28
S-II CENTER ENGINE CUTOFF (ENGINE SOLENOID)									
459.560	263717	52932	3703547	-3080.3	399.0	17103.4	-24.51	2.06	52.61
460.0	262360	53107	3711076	-3091.2	399.9	17124.2	-24.92	2.00	42.16
462.0	256127	53911	3745407	-3141.6	403.7	17207.4	-25.34	1.83	41.59
464.0	249794	54722	3779906	-3192.2	407.3	17290.7	-25.39	1.80	41.77
466.0	243359	55541	3814570	-3242.9	411.0	17374.4	-25.26	1.89	41.96
468.0	236822	56366	3849404	-3293.1	414.8	17458.6	-24.90	1.92	42.19
470.0	230187	57200	3884406	-3342.1	418.7	17543.2	-23.99	1.93	42.43
472.0	223455	58041	3919579	-3388.8	422.6	17628.2	-22.62	1.97	42.66
474.0	216634	58890	3954923	-3432.8	426.4	17714.6	-21.48	1.85	42.91
476.0	209725	59747	3990438	-3475.3	430.2	17800.7	-21.16	1.96	43.19
478.0	202732	60611	4026126	-3517.7	434.2	17887.3	-21.33	1.99	43.44
480.0	195653	61483	4061988	-3560.6	438.0	17974.4	-21.52	1.90	43.69
482.0	188487	62363	4098026	-3603.8	442.1	18062.0	-21.68	2.11	43.94
484.0	181235	63252	4134239	-3647.3	446.2	18150.1	-21.82	1.99	44.23
486.0	173894	64148	4170620	-3692.7	450.1	18228.7	-23.28	1.93	38.39
488.0	166461	65052	4207156	-3739.7	454.1	18305.4	-23.68	2.04	38.39
490.0	158933	65964	4243844	-3787.3	458.2	18382.3	-23.89	2.05	38.56
492.0	151311	66885	4280688	-3835.3	462.3	18459.6	-24.04	2.07	38.74
494.0	143592	67813	4317686	-3883.4	466.4	18538.0	-24.24	2.07	38.96
496.0	135777	68750	4354840	-3932.2	470.6	18616.1	-24.54	2.09	39.19
498.0	127863	69696	4392151	-3981.8	474.8	18694.7	-25.03	2.12	39.44
500.0	119849	70650	4429619	-4032.4	479.0	18773.9	-25.64	2.15	39.71
502.0	111733	71612	4467246	-4084.2	483.4	18853.6	-26.09	2.19	40.00
504.0	103512	72583	4505034	-4136.5	487.8	18933.8	-26.31	2.22	40.24
506.0	95186	73563	4542982	-4189.3	492.2	19014.5	-26.43	2.23	40.47
508.0	86754	74552	4581092	-4242.4	496.7	19095.8	-26.60	2.24	40.74
510.0	78216	75550	4619366	-4295.8	501.2	19177.6	-26.82	2.24	41.04
512.0	69571	76557	4657803	-4349.6	505.7	19259.9	-26.97	2.24	41.33
514.0	60818	77573	4696406	-4403.6	510.2	19342.8	-27.09	2.25	41.58

TABLE C-I. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S	DDXE FT/S <sup>2</sup>	DDYE FT/S <sup>2</sup>	DDZE FT/S <sup>2</sup>
516.0	51956	78597	4735175	-4458.0	514.7	19426.3	-27.22	2.28	41.84
518.0	42986	79631	4774111	-4512.6	519.3	19510.2	-27.39	2.31	42.14
520.0	33906	80675	4813216	-4567.5	523.9	19594.8	-27.56	2.32	42.44
522.0	24715	81727	4852491	-4622.8	528.6	19680.0	-27.71	2.35	42.73
524.0	15414	82789	4891936	-4678.3	533.3	19765.7	-27.82	2.37	43.01
526.0	6002	83860	4931554	-4734.1	538.1	19852.0	-27.94	2.39	43.30
528.0	-3522	84941	4971345	-4790.1	542.8	19938.9	-28.07	2.39	43.59
530.0	-13159	86032	5011310	-4846.4	547.6	20026.4	-28.20	2.40	43.89
532.0	-22908	87132	5051451	-4902.9	552.5	20114.5	-28.33	2.43	44.23
534.0	-32770	88241	5091769	-4959.7	557.4	20203.3	-28.45	2.47	44.56
536.0	-42747	89361	5132265	-5016.7	562.3	20292.7	-28.57	2.50	44.85
538.0	-52837	90491	5172940	-5074.0	567.3	20382.7	-28.69	2.52	45.16
540.0	-63043	91631	5213796	-5131.5	572.4	20473.3	-28.84	2.54	45.41
542.0	-73363	92780	5254834	-5189.3	577.5	20564.8	-28.99	2.57	45.85
544.0	-83800	93940	5296055	-5247.4	582.6	20657.0	-29.13	2.58	46.36
546.0	-94354	95111	5337460	-5305.8	587.8	20750.2	-29.26	2.54	46.86
548.0	-105024	96291	5379052	-5364.5	592.7	20844.4	-29.40	2.36	47.37
549.060	-110727	96921	5401162	-5395.7	595.0	20894.7	-29.48	2.09	47.64
550.0	-115810	97481	5420792	-5422.7	596.9	20901.2	-26.65	1.78	-9.60
550.100	-116353	97541	5422881	-5425.4	597.0	20900.3	-26.65	1.75	-9.60
552.0	-126706	98678	5462562	-5476.0	600.0	20882.0	-26.65	1.41	-9.60
554.0	-137710	99881	5504304	-5529.4	602.7	20864.1	-26.80	1.41	-4.15
556.0	-148821	101089	5546036	-5583.8	605.7	20872.6	-27.48	1.61	8.64
558.0	-160042	102304	5587799	-5638.9	609.1	20891.2	-27.50	1.72	9.58
560.0	-171373	103526	5629600	-5694.0	612.5	20910.2	-27.73	1.63	9.74
562.0	-182815	104754	5671440	-5749.9	615.7	20929.6	-28.13	1.61	9.91
564.0	-194370	105988	5713319	-5805.7	618.9	20949.5	-28.28	1.62	9.91
566.0	-206038	107229	5755238	-5862.2	622.2	20969.4	-28.23	1.66	9.97
568.0	-217819	108477	5797197	-5918.6	625.5	20989.3	-28.18	1.69	9.99
570.0	-229713	109731	5839196	-5975.1	628.9	21009.3	-28.27	1.71	10.01
572.0	-241720	110993	5881234	-6031.8	632.4	21029.4	-28.44	1.76	10.01
574.0	-253840	112261	5923313	-6088.8	635.9	21049.4	-28.57	1.80	9.99
576.0	-266075	113536	5965432	-6146.0	639.6	21069.3	-28.65	1.84	9.96
578.0	-278424	114819	6007590	-6203.4	643.3	21089.2	-28.71	1.88	9.93
580.0	-290888	116110	6049789	-6260.8	647.1	21109.0	-28.76	1.90	9.90
582.0	-303468	117408	6092027	-6318.4	650.9	21128.8	-28.81	1.90	9.88
584.0	-316162	118713	6134304	-6376.1	654.7	21148.6	-28.85	1.90	9.88

## S-II OUTBOARD ENGINE CUTOFF (ENGINE SOLENOID)

549.060 -110727 96921 5401162

550.0 -115810 97481 5420792

## S-II/S-IVB SEPARATION COMMAND

550.100 -116353 97541 5422881

552.0 -126706 98678 5462562

554.0 -137710 99881 5504304

556.0 -148821 101089 5546036

558.0 -160042 102304 5587799

560.0 -171373 103526 5629600

562.0 -182815 104754 5671440

564.0 -194370 105988 5713319

566.0 -206038 107229 5755238

568.0 -217819 108477 5797197

570.0 -229713 109731 5839196

572.0 -241720 110993 5881234

574.0 -253840 112261 5923313

576.0 -266075 113536 5965432

578.0 -278424 114819 6007590

580.0 -290888 116110 6049789

582.0 -303468 117408 6092027

584.0 -316162 118713 6134304



TABLE C-1. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S	DDXE FT/S <sup>2</sup>	DDYE FT/S <sup>2</sup>	DDZE FT/S <sup>2</sup>
586.0	-328972	120026	6176621	-6433.8	658.5	21168.4	-28.88	1.92	9.91
588.0	-341897	121347	6218977	-6491.6	662.4	21188.2	-28.88	1.94	9.92
590.0	-354938	122676	6261374	-6549.3	666.2	21208.0	-28.86	1.94	9.92
592.0	-368095	124012	6303809	-6607.0	670.1	21227.9	-28.85	1.95	9.92
594.0	-381366	125356	6346285	-6664.8	674.1	21247.7	-28.88	1.97	9.92
596.0	-394754	126708	6388800	-6722.6	678.0	21267.5	-28.95	2.00	9.92
598.0	-408257	128068	6431355	-6780.5	682.0	21287.4	-29.01	2.01	9.94
600.0	-421876	129436	6473950	-6838.6	686.0	21307.3	-29.04	1.99	9.95
602.0	-435611	130812	6516584	-6896.7	690.0	21327.2	-29.08	1.99	9.91
604.0	-449463	132196	6559259	-6954.9	694.0	21346.9	-29.12	2.00	9.87
606.0	-463431	133588	6601972	-7013.2	698.0	21366.7	-29.15	1.99	9.85
608.0	-477516	134988	6644725	-7071.5	702.0	21386.3	-29.16	1.99	9.83
610.0	-491717	136396	6687518	-7129.8	706.0	21406.0	-29.16	1.99	9.80
612.0	-506035	137812	6730349	-7188.2	709.9	21425.5	-29.18	2.01	9.77
614.0	-520470	139236	6773220	-7246.5	714.0	21445.1	-29.19	2.01	9.80
616.0	-535021	140668	6816130	-7304.9	718.0	21464.8	-29.17	2.02	9.85
618.0	-549689	142108	6859079	-7363.2	722.0	21484.5	-29.15	2.03	9.89
620.0	-564474	143556	6902068	-7421.5	726.1	21504.3	-29.17	2.01	9.87
622.0	-579375	145012	6945096	-7479.9	730.0	21523.9	-29.21	1.97	9.81
624.0	-594394	146476	6988163	-7538.4	734.0	21543.5	-29.25	1.96	9.76
626.0	-609529	147948	7031270	-7596.9	737.9	21563.0	-29.30	1.97	9.74
628.0	-624781	149428	7074415	-7655.6	741.8	21582.5	-29.35	1.97	9.74
630.0	-640151	150916	7117600	-7714.3	745.8	21602.0	-29.38	1.98	9.74
632.0	-655638	152411	7160823	-7773.0	749.8	21621.4	-29.37	1.98	9.73
634.0	-671243	153915	7204085	-7831.7	753.7	21640.9	-29.33	1.98	9.72
636.0	-686965	155426	7247387	-7890.4	757.7	21660.3	-29.30	1.99	9.74
638.0	-702805	156946	7290727	-7948.9	761.7	21679.8	-29.27	1.99	9.72
640.0	-718761	158473	7334106	-8007.5	765.6	21699.2	-29.29	1.96	9.69
642.0	-734835	160008	7377524	-8066.1	769.5	21718.6	-29.32	1.94	9.67
644.0	-751026	161551	7420980	-8124.8	773.4	21738.0	-29.37	1.96	9.69
646.0	-767334	163102	7464476	-8183.6	777.4	21757.4	-29.40	1.98	9.72
648.0	-783760	164660	7508010	-8242.4	781.3	21776.8	-29.40	1.97	9.71
650.0	-800303	166227	7551583	-8301.2	785.2	21796.2	-29.40	1.95	9.69
652.0	-816964	167801	7595194	-8360.0	789.1	21815.6	-29.40	1.95	9.69
654.0	-833743	169384	7638845	-8418.8	793.0	21834.9	-29.42	1.95	9.67
656.0	-850640	170973	7682534	-8477.6	796.9	21854.3	-29.45	1.96	9.66
658.0	-867654	172571	7726262	-8536.6	800.9	21873.6	-29.47	1.96	9.66
660.0	-884786	174177	7770029	-8595.5	804.8	21892.9	-29.47	1.95	9.67
662.0	-902036	175790	7813834	-8654.4	808.7	21912.3	-29.46	1.93	9.70
664.0	-919403	177412	7857678	-8713.4	812.5	21931.7	-29.50	1.92	9.73
666.0	-936889	179040	7901560	-8772.5	816.4	21951.1	-29.62	1.92	9.72
668.0	-954494	180677	7945482	-8831.9	820.2	21970.6	-29.74	1.93	9.69
670.0	-972217	182321	7989443	-8891.4	824.1	21989.9	-29.77	1.93	9.66

TABLE C-1. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S	DDXE FT/S <sup>2</sup>	DDYE FT/S <sup>2</sup>	DDZE FT/S <sup>2</sup>
672.0	-990059	183973	8033442	-8950.8	827.9	22009.2	-29.68	1.94	9.66
674.0	-1008020	185633	8077480	-9010.1	831.8	22028.6	-29.58	1.96	9.68
676.0	-1026099	187301	8121556	-9069.2	835.7	22047.9	-29.55	1.96	9.68
678.0	-1044297	188976	8165671	-9128.4	839.7	22067.3	-29.59	1.95	9.67
680.0	-1062613	190659	8209825	-9187.6	843.6	22086.6	-29.62	1.94	9.66
682.0	-1081047	192350	8254018	-9246.8	847.4	22105.9	-29.59	1.95	9.67
684.0	-1099600	194049	8298249	-9305.9	851.3	22125.3	-29.54	1.95	9.68
686.0	-1118271	195756	8342519	-9364.9	855.2	22144.7	-29.48	1.95	9.69
688.0	-1137059	197470	8386828	-9423.9	859.2	22164.0	-29.42	2.02	9.69
690.0	-1155966	199192	8431175	-9482.7	863.0	22183.4	-29.38	2.01	9.68
692.0	-1174990	200922	8475562	-9541.4	867.0	22202.7	-29.33	1.84	9.68
694.0	-1194132	202660	8519987	-9600.0	870.9	22222.0	-29.28	1.92	9.67
S-IVB 1ST GUIDANCE CUTOFF									
694.670	-1200572	203244	8534879	-9619.6	872.1	22228.5	-29.26	1.73	9.67
696.0	-1213389	204405	8564441	-9654.1	874.2	22219.8	-25.11	1.48	-11.03
698.0	-1232748	206157	8608857	-9704.3	877.2	22197.7	-25.08	1.48	-11.07
700.0	-1252208	207914	8653231	-9754.8	880.1	22175.6	-25.05	1.48	-10.95
702.0	-1271768	209677	8697560	-9804.9	883.1	22153.5	-25.02	1.47	-11.16
704.0	-1291428	211446	8741844	-9855.0	886.0	22131.2	-25.00	1.47	-11.18
PARKING ORBIT INSERTION									
704.670	-1298036	212040	8756668	-9871.7	887.0	22123.7	-25.00	1.47	-11.21

TABLE C-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE

TIME SEC	XS NM	YS NM	ZS NM	DXS FT/S	DYS FT/S	DZS FT/S	DDXS FT/S SQ	DDYS FT/S SQ	DDZS FT/S SQ
GUIDANCE REFERENCE RELEASE									
-16.939	3441.351	9.553	-1.669	0.0	230.8	1320.7	-0.07	-0.04	0.00
-16.0	3441.351	9.589	-1.465	-0.1	230.7	1320.7	-0.07	-0.04	0.00
-15.0	3441.351	9.627	-1.248	-0.2	230.7	1320.7	-0.07	-0.04	0.00
-14.0	3441.351	9.664	-1.030	-0.3	230.6	1320.7	-0.07	-0.04	0.00
-13.0	3441.351	9.702	-0.813	-0.3	230.6	1320.7	-0.07	-0.04	0.00
-12.0	3441.351	9.740	-0.596	-0.4	230.6	1320.7	-0.07	-0.04	0.00
-11.0	3441.351	9.778	-0.378	-0.5	230.5	1320.7	-0.07	-0.04	0.00
-10.0	3441.350	9.816	-0.161	-0.6	230.5	1320.7	-0.07	-0.04	0.00
-9.0	3441.350	9.854	0.056	-0.7	230.4	1320.7	-0.07	-0.04	0.00
-8.0	3441.350	9.892	0.274	-0.8	230.4	1320.7	-0.07	-0.04	0.00
-7.0	3441.350	9.930	0.491	-0.9	230.3	1320.8	-0.07	-0.04	0.00
-6.0	3441.350	9.968	0.708	-0.9	230.3	1320.8	-0.07	-0.04	0.00
-5.0	3441.350	10.006	0.926	-1.0	230.2	1320.8	-0.07	-0.04	0.00
-4.0	3441.350	10.044	1.143	-1.1	230.2	1320.8	-0.07	-0.04	0.00
-3.0	3441.349	10.082	1.361	-1.2	230.1	1320.8	-0.07	-0.04	0.00
-2.0	3441.349	10.119	1.578	-1.3	230.1	1320.8	-0.07	-0.04	0.00
-1.0	3441.349	10.157	1.795	-1.4	230.0	1320.8	-0.07	-0.04	0.00
0.0	3441.349	10.195	2.013	-1.5	230.0	1320.8	-0.07	-0.04	0.00
ALL HOLDOWN ARMS RELEASED									
0.300	3441.349	10.207	2.078	-1.0	230.0	1320.8	2.61	-0.04	-0.00
LIFTOFF - START OF TIME BASE 1									
0.600	3441.349	10.218	2.143	0.0	230.0	1320.8	3.60	-0.03	0.00
1.0	3441.349	10.233	2.230	2.2	230.0	1320.8	7.29	0.05	-0.09
2.0	3441.350	10.271	2.447	9.7	230.1	1320.7	7.59	0.15	-0.08
3.0	3441.352	10.309	2.665	17.4	230.2	1320.6	7.77	0.20	-0.09
4.0	3441.355	10.347	2.882	25.3	230.5	1320.5	7.96	0.32	-0.08
5.0	3441.360	10.385	3.099	33.3	230.8	1320.4	8.17	0.35	-0.09
6.0	3441.366	10.423	3.317	41.6	231.2	1320.3	8.32	0.42	-0.10
7.0	3441.374	10.461	3.534	50.0	231.7	1320.2	8.54	0.85	-0.20
8.0	3441.383	10.499	3.751	58.6	232.6	1320.0	8.74	0.99	-0.19
9.0	3441.393	10.537	3.969	67.5	233.6	1319.9	9.08	0.85	-0.12
10.0	3441.405	10.576	4.186	76.7	234.2	1319.8	9.33	0.48	-0.04
11.0	3441.419	10.614	4.403	86.2	234.5	1319.8	9.60	0.19	0.07
12.0	3441.434	10.653	4.620	95.9	234.7	1320.0	9.78	0.16	0.17
13.0	3441.450	10.692	4.837	105.7	234.9	1320.2	9.81	0.25	0.25
14.0	3441.468	10.730	5.055	115.5	235.2	1320.5	9.97	0.29	0.33

TABLE C-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XS NM	YS NM	ZS NM	DXS FT/S	DYS FT/S	DZS FT/S	DDXS FT/S SQ	DDYS FT/S SQ	DDZS FT/S SQ
15.0	3441.488	10.769	5.272	125.6	235.4	1320.8	10.20	0.17	0.36
16.0	3441.510	10.808	5.489	135.9	235.4	1321.2	10.47	-0.09	0.42
17.0	3441.533	10.847	5.707	146.4	235.2	1321.6	10.66	-0.31	0.49
18.0	3441.558	10.885	5.924	157.2	234.9	1322.2	10.87	-0.34	0.61
19.0	3441.585	10.924	6.142	168.2	234.6	1322.9	11.12	-0.26	0.75
20.0	3441.613	10.962	6.360	179.4	234.3	1323.7	11.35	-0.20	0.80
21.0	3441.644	11.001	6.578	190.9	234.1	1324.5	11.59	-0.14	0.92
22.0	3441.676	11.039	6.796	202.6	233.9	1325.5	11.84	-0.15	1.07
23.0	3441.710	11.078	7.014	214.5	233.8	1326.7	12.08	-0.14	1.22
24.0	3441.747	11.116	7.233	226.7	233.6	1328.0	12.32	-0.17	1.40
25.0	3441.785	11.155	7.451	239.1	233.4	1329.5	12.57	-0.20	1.62
26.0	3441.825	11.193	7.670	251.8	233.2	1331.3	12.81	-0.22	1.87
27.0	3441.868	11.232	7.889	264.7	233.0	1333.3	13.06	-0.22	2.14
28.0	3441.913	11.270	8.109	277.9	232.8	1335.5	13.32	-0.21	2.43
29.0	3441.959	11.308	8.329	291.4	232.5	1338.1	13.59	-0.22	2.72
30.0	3442.009	11.346	8.550	305.1	232.3	1341.0	13.85	-0.22	3.04
31.0	3442.060	11.385	8.771	319.0	232.1	1344.2	14.13	-0.24	3.37
32.0	3442.114	11.423	8.992	333.3	231.8	1347.8	14.40	-0.26	3.73
33.0	3442.170	11.461	9.214	347.8	231.5	1351.7	14.66	-0.27	4.12
34.0	3442.228	11.499	9.437	362.6	231.3	1356.0	14.93	-0.27	4.52
35.0	3442.289	11.537	9.661	377.6	231.0	1360.7	15.20	-0.27	4.94
36.0	3442.352	11.575	9.885	393.0	230.7	1365.9	15.47	-0.25	5.37
37.0	3442.418	11.613	10.110	408.5	230.5	1371.5	15.74	-0.24	5.82
38.0	3442.487	11.651	10.336	424.4	230.2	1377.6	16.00	-0.23	6.30
39.0	3442.558	11.689	10.564	440.5	230.0	1384.1	16.27	-0.23	6.80
40.0	3442.632	11.727	10.792	456.9	229.7	1391.2	16.53	-0.25	7.33
41.0	3442.708	11.764	11.022	473.5	229.5	1398.8	16.79	-0.26	7.87
42.0	3442.788	11.802	11.252	490.5	229.2	1406.9	17.06	-0.27	8.45
43.0	3442.870	11.840	11.485	507.6	228.9	1415.7	17.31	-0.28	9.04
44.0	3442.955	11.878	11.718	525.1	228.6	1425.1	17.56	-0.29	9.67
45.0	3443.043	11.915	11.954	542.7	228.3	1435.0	17.80	-0.29	10.29
46.0	3443.133	11.953	12.191	560.6	228.0	1445.7	18.03	-0.29	10.94
47.0	3443.227	11.990	12.430	578.7	227.7	1456.9	18.25	-0.28	11.60
48.0	3443.324	12.028	12.670	597.1	227.5	1468.9	18.47	-0.25	12.27
49.0	3443.424	12.065	12.913	615.7	227.2	1481.5	18.69	-0.21	12.95
50.0	3443.527	12.102	13.158	634.5	227.0	1494.8	18.93	-0.17	13.64
51.0	3443.633	12.140	13.405	653.5	226.9	1508.8	19.16	-0.12	14.34
52.0	3443.742	12.177	13.655	672.7	226.8	1523.5	19.38	-0.06	15.06
53.0	3443.854	12.214	13.907	692.2	226.7	1538.9	19.61	-0.03	15.80
54.0	3443.970	12.252	14.161	711.9	226.7	1555.1	19.79	-0.02	16.56
55.0	3444.088	12.289	14.419	731.8	226.7	1572.1	19.98	-0.01	17.34
56.0	3444.211	12.326	14.679	751.8	226.7	1589.8	20.16	-0.03	18.11
57.0	3444.336	12.364	14.942	772.1	226.6	1608.3	20.33	-0.04	18.87

TABLE C-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XS NM	YS NM	ZS NM	DXS FT/S	DYS FT/S	DZS FT/S	DDXS FT/S SQ	DDYS FT/S SQ	DDZS FT/S SQ
58.0	3444.465	12.401	15.208	792.5	226.6	1627.5	20.50	-0.07	19.64
59.0	3444.597	12.438	15.478	813.0	226.4	1647.6	20.63	-0.15	20.45
60.0	3444.732	12.476	15.751	833.7	226.2	1668.4	20.76	-0.20	21.23
61.0	3444.871	12.513	16.027	854.5	226.0	1690.1	20.85	-0.25	22.00
62.0	3445.014	12.550	16.307	875.4	225.7	1712.4	20.92	-0.28	22.75
63.0	3445.159	12.587	16.591	896.3	225.5	1735.5	20.96	-0.27	23.48
64.0	3445.309	12.624	16.878	917.2	225.3	1759.4	20.98	-0.22	24.20
MACH 1									
65.000	3445.461	12.661	17.170	938.2	225.1	1783.9	20.99	-0.14	24.93
66.0	3445.617	12.698	17.466	959.2	225.0	1809.2	21.03	-0.07	25.65
67.0	3445.777	12.735	17.765	980.2	224.9	1835.3	21.07	-0.00	26.38
68.0	3445.940	12.772	18.070	1001.3	224.9	1862.1	21.16	0.03	27.16
69.0	3446.107	12.809	18.378	1022.6	224.9	1889.6	21.28	0.02	28.00
70.0	3446.277	12.846	18.692	1043.9	224.9	1918.1	21.44	-0.02	28.85
71.0	3446.450	12.883	19.010	1065.4	224.8	1947.4	21.64	-0.07	29.70
72.0	3446.627	12.920	19.333	1087.2	224.7	1977.5	21.87	-0.11	30.55
73.0	3446.808	12.957	19.661	1109.2	224.6	2008.4	22.14	-0.13	31.34
74.0	3446.992	12.994	19.994	1131.4	224.5	2040.1	22.39	-0.15	32.16
75.0	3447.181	13.031	20.332	1153.9	224.3	2072.7	22.63	-0.10	32.95
76.0	3447.372	13.068	20.676	1176.6	224.3	2106.0	22.84	-0.04	33.74
77.0	3447.568	13.105	21.026	1199.5	224.3	2140.2	23.02	0.08	34.55
78.0	3447.767	13.142	21.381	1222.6	224.5	2175.2	23.16	0.23	35.41
79.0	3447.970	13.179	21.742	1245.8	224.8	2211.0	23.30	0.40	36.35
80.0	3448.177	13.216	22.108	1269.2	225.3	2247.9	23.40	0.56	37.39
81.0	3448.388	13.253	22.482	1292.6	225.9	2285.9	23.46	0.65	38.51
MAXIMUM DYNAMIC PRESSURE									
82.000	3448.603	13.290	22.861	1316.1	226.5	2325.0	23.49	0.66	39.72
83.0	3448.821	13.328	23.247	1339.5	227.1	2365.4	23.46	0.60	41.02
84.0	3449.044	13.365	23.640	1362.9	227.5	2407.1	23.40	0.45	42.37
85.0	3449.270	13.402	24.039	1386.2	227.9	2450.2	23.29	0.29	43.72
86.0	3449.500	13.440	24.446	1409.4	228.2	2494.5	23.17	0.15	45.04
87.0	3449.734	13.478	24.860	1432.5	228.3	2540.2	23.05	0.02	46.31
88.0	3449.971	13.515	25.282	1455.6	228.3	2587.1	23.00	-0.06	47.50
89.0	3450.213	13.553	25.712	1478.6	228.2	2635.1	23.01	-0.11	48.63
90.0	3450.458	13.590	26.150	1501.6	228.1	2684.3	23.07	-0.11	49.71
91.0	3450.707	13.628	26.596	1524.7	227.9	2734.5	23.18	-0.12	50.75
92.0	3450.960	13.665	27.050	1548.0	227.8	2785.8	23.31	-0.13	51.75
93.0	3451.217	13.703	27.513	1571.3	227.7	2838.0	23.44	-0.14	52.74
94.0	3451.477	13.740	27.984	1594.8	227.5	2891.3	23.57	-0.20	53.74

TABLE C-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XS NM	YS NM	ZS NM	DXS FT/S	DYS FT/S	DZS FT/S	DDXS FT/S SQ	DDYS FT/S SQ	DDZS FT/S SQ
95.0	3451.742	13.778	28.465	1618.4	227.2	2945.5	23.68	-0.28	54.74
96.0	3452.010	13.815	28.954	1642.1	226.9	3000.8	23.76	-0.37	55.76
97.0	3452.282	13.852	29.452	1665.9	226.4	3057.1	23.81	-0.47	56.82
98.0	3452.558	13.889	29.960	1689.7	225.9	3114.5	23.84	-0.56	57.91
99.0	3452.838	13.927	30.478	1713.5	225.3	3173.0	23.87	-0.61	59.03
100.0	3453.122	13.964	31.005	1737.4	224.7	3232.6	23.90	-0.61	60.17
101.0	3453.410	14.001	31.542	1761.3	224.2	3293.3	23.92	-0.55	61.30
102.0	3453.702	14.037	32.089	1785.2	223.7	3355.2	23.93	-0.45	62.42
103.0	3453.998	14.074	32.646	1809.2	223.3	3418.1	23.96	-0.33	63.53
104.0	3454.298	14.111	33.214	1833.1	223.0	3482.2	24.00	-0.21	64.61
105.0	3454.601	14.148	33.792	1857.1	222.8	3547.3	24.04	-0.12	65.67
106.0	3454.909	14.184	34.382	1881.2	222.7	3613.5	24.11	-0.06	66.71
107.0	3455.220	14.221	34.982	1905.3	222.6	3680.8	24.21	-0.05	67.75
108.0	3455.536	14.258	35.593	1929.6	222.5	3749.1	24.33	-0.07	68.80
109.0	3455.856	14.294	36.216	1954.0	222.4	3818.4	24.52	-0.12	69.84
110.0	3456.179	14.331	36.850	1978.6	222.3	3888.8	24.74	-0.20	70.88
111.0	3456.507	14.367	37.496	2003.5	222.0	3960.1	24.97	-0.26	71.91
112.0	3456.839	14.404	38.154	2028.5	221.8	4032.6	25.18	-0.29	72.97
113.0	3457.175	14.440	38.823	2053.8	221.5	4106.1	25.36	-0.29	74.04
114.0	3457.515	14.477	39.505	2079.2	221.2	4180.7	25.49	-0.26	75.15
115.0	3457.859	14.513	40.200	2104.7	221.0	4256.4	25.55	-0.23	76.31
116.0	3458.207	14.549	40.906	2130.2	220.7	4333.4	25.55	-0.19	77.52
117.0	3458.560	14.586	41.626	2155.7	220.5	4411.5	25.51	-0.18	78.80
118.0	3458.917	14.622	42.359	2181.2	220.3	4491.0	25.45	-0.22	80.13
119.0	3459.278	14.658	43.104	2206.6	220.0	4571.8	25.38	-0.28	81.51
120.0	3459.643	14.694	43.863	2231.9	219.7	4654.0	25.33	-0.35	82.92
121.0	3460.013	14.731	44.636	2257.2	219.3	4737.7	25.29	-0.43	84.25
122.0	3460.386	14.767	45.423	2282.5	218.9	4822.7	25.30	-0.49	85.67
123.0	3460.764	14.803	46.224	2307.8	218.4	4909.2	25.32	-0.53	87.08
124.0	3461.146	14.839	47.039	2333.1	217.8	4997.0	25.39	-0.55	88.49
125.0	3461.532	14.874	47.869	2358.6	217.3	5086.3	25.49	-0.55	89.91
126.0	3461.922	14.910	48.713	2384.1	216.7	5177.0	25.63	-0.54	91.32
127.0	3462.317	14.946	49.573	2409.8	216.2	5269.0	25.78	-0.52	92.73
128.0	3462.715	14.981	50.448	2435.6	215.6	5362.6	25.97	-0.59	94.17
129.0	3463.119	15.017	51.338	2461.6	215.1	5457.5	26.15	-0.44	95.65
130.0	3463.526	15.052	52.244	2487.9	214.7	5553.9	26.33	-0.45	97.13
131.0	3463.937	15.087	53.166	2514.3	214.1	5651.7	26.52	-0.53	98.61
132.0	3464.353	15.123	54.104	2540.9	213.7	5751.1	26.71	-0.47	100.11
133.0	3464.774	15.158	55.059	2567.7	213.1	5852.0	26.91	-0.60	101.70
134.0	3465.199	15.193	56.031	2594.7	212.5	5954.5	27.13	-0.64	103.29
135.0	3465.628	15.228	57.019	2621.9	211.9	6058.6	27.36	-0.54	104.87
135.960	S-IC CENTER ENGINE CUTOFF (ENGINE SOLENOID)								
	3466.044	15.261	57.985	2648.2	211.4	6160.0	27.57	-0.52	106.40

TABLE C-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XS NM	YS NM	ZS NM	DXS FT/S	DYS FT/S	DZS FT/S	DDXS FT/S SQ	DDYS FT/S SQ	DDZS FT/S SQ
136.0	3466.062	15.262	58.025	2649.3	211.3	6164.3	27.58	-0.52	106.46
137.0	3466.499	15.297	59.048	2658.7	210.8	6256.8	16.01	-0.56	86.44
138.0	3466.939	15.332	60.084	2684.7	210.2	6343.2	16.07	-0.59	86.32
139.0	3467.383	15.366	61.135	2700.8	209.7	6429.9	16.19	-0.43	86.99
140.0	3467.828	15.401	62.200	2717.1	209.3	6517.4	16.36	-0.43	88.05
141.0	3468.276	15.435	63.280	2733.5	208.8	6606.0	16.53	-0.40	89.24
142.0	3468.728	15.470	64.375	2750.1	208.4	6695.9	16.70	-0.43	90.52
143.0	3469.181	15.504	65.484	2766.9	207.9	6787.1	16.87	-0.47	91.83
144.0	3469.638	15.538	66.609	2783.8	207.4	6879.9	17.04	-0.49	93.22
145.0	3470.098	15.572	67.749	2800.9	206.9	6973.8	17.22	-0.51	94.56
146.0	3470.560	15.606	68.904	2818.2	206.4	7069.0	17.39	-0.52	95.93
147.0	3471.025	15.640	70.076	2835.2	205.9	7165.6	17.55	-0.53	97.34
148.0	3471.493	15.674	71.263	2852.8	205.4	7263.6	17.69	-0.53	98.72
149.0	3471.964	15.708	72.467	2870.6	204.8	7363.0	17.84	-0.52	100.10
150.0	3472.438	15.741	73.687	2888.5	204.3	7463.9	18.01	-0.52	101.50
151.0	3472.915	15.775	74.924	2906.6	203.8	7566.1	18.19	-0.52	102.89
152.0	3473.395	15.808	76.177	2924.9	203.2	7669.8	18.40	-0.53	104.45
153.0	3473.878	15.842	77.448	2943.3	202.7	7775.1	18.44	-0.56	106.01
154.0	3474.364	15.875	78.737	2961.8	202.1	7881.9	18.68	-0.58	107.56
155.0	3474.853	15.908	80.043	2980.6	201.6	7990.3	18.91	-0.43	109.12
156.0	3475.345	15.941	81.367	2999.6	201.1	8100.2	19.14	-0.63	110.68
157.0	3475.840	15.975	82.709	3018.9	200.4	8211.7	19.37	-0.58	112.24
158.0	3476.338	16.007	84.069	3038.3	199.9	8324.7	19.60	-0.51	113.80
159.0	3476.840	16.040	85.449	3058.0	199.3	8439.3	19.83	-0.60	115.35
159.560	3477.122	16.059	86.229	3069.2	199.0	8504.2	19.96	-0.57	116.23
160.0	3477.344	16.073	86.846	3068.6	198.9	8532.8	-22.48	-0.06	14.07
161.0	3477.847	16.106	88.250	3040.0	198.8	8537.4	-32.05	-0.09	-1.21
161.200	3477.947	16.112	88.531	3033.6	198.8	8537.1	-31.99	-0.09	-1.20
162.0	3478.344	16.139	89.654	3008.1	198.7	8536.1	-31.80	-0.09	-1.13
164.0	3479.325	16.204	92.464	2946.5	198.4	8536.6	-29.33	-0.14	6.38
166.0	3480.286	16.269	95.279	2896.0	198.1	8564.3	-23.59	-0.14	16.34
168.0	3481.232	16.334	98.102	2850.0	197.9	8598.6	-21.45	-0.09	20.40
170.0	3482.163	16.399	100.940	2807.5	197.7	8641.9	-21.16	-0.09	21.99
172.0	3483.080	16.464	103.791	2764.9	197.6	8684.9	-20.85	-0.05	22.40
174.0	3483.983	16.529	106.658	2723.3	197.4	8729.9	-20.77	-0.05	22.50
176.0	3484.873	16.594	109.539	2681.8	197.3	8775.1	-20.72	-0.05	22.58
178.0	3485.749	16.659	112.434	2640.4	197.2	8820.3	-20.64	-0.05	22.68

## S-IC OUTBOARD ENGINE CUTOFF (ENGINE SOLENOID)

## S-IC/S-II SEPARATION COMMAND

TABLE C-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XS NM	YS NM	ZS NM	DXS FT/S	DYS FT/S	DZS FT/S	DDXS FT/S SQ	DDYS FT/S SQ	DDZS FT/S SQ
180.0	3486.611	16.724	115.345	2599.2	197.1	8865.8	-20.56	-0.05	22.76
182.0	3487.460	16.789	118.271	2558.1	197.0	8911.4	-20.50	-0.05	22.84
184.0	3488.295	16.854	121.212	2517.1	196.9	8957.2	-20.44	-0.05	22.93
186.0	3489.117	16.919	124.167	2476.3	196.8	9003.1	-20.38	-0.05	23.02
188.0	3489.925	16.983	127.139	2435.6	196.6	9049.3	-20.32	-0.05	23.12
190.0	3490.720	17.048	130.125	2395.0	196.5	9095.6	-20.24	-0.05	23.22
192.0	3491.502	17.113	133.126	2354.6	196.4	9142.2	-20.15	-0.05	23.31
194.0	3492.270	17.177	136.143	2314.3	196.3	9188.9	-20.05	-0.04	23.43
196.0	3493.025	17.242	139.176	2274.3	196.2	9235.9	-19.96	-0.05	23.57
198.0	3493.767	17.307	142.223	2234.4	196.1	9283.2	-19.88	-0.05	23.71
200.0	3494.496	17.371	145.287	2194.7	195.9	9330.7	-19.77	-0.05	23.89
202.0	3495.212	17.436	148.366	2155.2	195.8	9378.4	-19.68	-0.05	24.08
204.0	3495.915	17.500	151.461	2115.4	195.7	9426.4	-19.58	-0.03	24.35
206.0	3496.605	17.564	154.572	2075.0	195.7	9474.8	-20.41	-0.01	24.68
208.0	3497.281	17.629	157.698	2033.6	195.7	9523.9	-20.94	0.04	24.97
210.0	3497.943	17.693	160.841	1991.2	195.8	9573.5	-21.39	0.05	25.17
212.0	3498.592	17.758	164.001	1948.2	195.8	9623.7	-21.61	0.05	25.29
214.0	3499.226	17.822	167.177	1904.9	195.9	9674.2	-21.64	0.03	25.39
216.0	3499.846	17.887	170.370	1861.6	196.0	9724.9	-21.60	0.03	25.47
218.0	3500.451	17.951	173.579	1818.4	196.0	9775.8	-21.59	0.05	25.57
220.0	3501.043	18.016	176.805	1775.1	196.1	9826.8	-21.61	0.07	25.66
222.0	3501.620	18.080	180.048	1731.9	196.3	9878.0	-21.60	0.07	25.77
224.0	3502.183	18.145	183.308	1688.7	196.4	9929.5	-21.59	0.07	25.88
226.0	3502.732	18.210	186.585	1645.4	196.5	9981.2	-21.59	0.07	26.00
228.0	3503.266	18.274	189.879	1602.2	196.6	10033.0	-21.59	0.07	26.12
230.0	3503.786	18.339	193.190	1559.0	196.8	10085.2	-21.61	0.08	26.23
232.0	3504.292	18.404	196.518	1515.7	196.9	10137.5	-21.60	0.06	26.34
234.0	3504.784	18.469	199.863	1472.5	197.0	10190.1	-21.59	0.02	26.47
236.0	3505.262	18.534	203.226	1429.3	196.9	10242.9	-21.58	-0.01	26.60
238.0	3505.725	18.598	206.607	1386.1	196.9	10296.0	-21.58	-0.01	26.71
240.0	3506.174	18.663	210.004	1342.9	196.9	10349.3	-21.61	0.01	26.81
242.0	3506.609	18.728	213.420	1299.6	196.9	10402.9	-21.64	0.01	26.93
244.0	3507.030	18.793	216.853	1256.3	196.9	10456.6	-21.66	-0.01	27.07
246.0	3507.436	18.858	220.304	1212.9	196.8	10510.6	-21.67	-0.03	27.20
248.0	3507.828	18.922	223.772	1169.5	196.8	10564.9	-21.68	-0.02	27.31
250.0	3508.206	18.987	227.259	1126.1	196.7	10619.4	-21.68	-0.02	27.42
252.0	3508.570	19.052	230.763	1082.7	196.6	10674.2	-21.67	-0.02	27.54
254.0	3508.919	19.117	234.286	1039.3	196.6	10729.1	-21.68	-0.02	27.65
256.0	3509.254	19.181	237.826	995.9	196.5	10784.3	-21.70	-0.02	27.76
258.0	3509.575	19.246	241.385	952.5	196.4	10839.8	-21.72	-0.02	27.89
260.0	3509.881	19.311	244.962	909.0	196.4	10895.4	-21.73	-0.03	28.03
262.0	3510.173	19.375	248.558	865.5	196.3	10951.4	-21.73	-0.03	28.18
264.0	3510.451	19.440	252.172	822.0	196.2	11007.6	-21.73	-0.03	



TABLE C-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XS NM	YS NM	ZS NM	DXS FT/S	DYS FT/S	DZS FT/S	DDXS FT/S SQ	DDYS FT/S SQ	DDZS FT/S SQ
266.0	3510.714	19.504	255.804	778.4	196.1	11064.1	-21.75	-0.03	28.30
268.0	3510.963	19.569	259.455	734.9	196.1	11120.8	-21.77	-0.03	28.41
270.0	3511.198	19.633	263.125	691.3	196.0	11177.7	-21.77	-0.03	28.54
272.0	3511.418	19.698	266.814	647.7	195.9	11235.0	-21.78	-0.02	28.67
274.0	3511.624	19.762	270.521	604.1	195.9	11292.4	-21.81	-0.03	28.81
276.0	3511.816	19.827	274.248	560.4	195.8	11350.2	-21.85	-0.05	28.95
278.0	3511.993	19.891	277.993	516.6	195.6	11408.3	-21.88	-0.06	29.09
280.0	3512.156	19.956	281.758	472.8	195.5	11466.6	-21.88	-0.05	29.24
282.0	3512.304	20.020	285.542	429.0	195.4	11525.3	-21.88	-0.04	29.38
284.0	3512.439	20.084	289.345	385.2	195.3	11584.1	-21.90	-0.06	29.50
286.0	3512.558	20.149	293.168	341.4	195.1	11643.3	-21.93	-0.07	29.64
288.0	3512.663	20.213	297.010	297.4	195.0	11702.8	-21.96	-0.05	29.79
290.0	3512.754	20.277	300.872	253.4	194.9	11762.5	-22.00	-0.05	29.95
292.0	3512.830	20.341	304.754	209.4	194.7	11822.6	-22.03	-0.06	30.10
294.0	3512.892	20.405	308.655	165.2	194.6	11882.9	-22.06	-0.06	30.24
296.0	3512.939	20.469	312.577	121.1	194.5	11943.6	-22.07	-0.05	30.40
298.0	3512.971	20.533	316.518	76.9	194.3	12004.5	-22.07	-0.05	30.55
300.0	3512.989	20.597	320.479	32.7	194.2	12065.8	-22.09	-0.06	30.70
302.0	3512.993	20.661	324.461	-11.6	194.1	12127.3	-22.13	-0.07	30.85
304.0	3512.982	20.725	328.463	-55.9	193.9	12189.2	-22.17	-0.07	31.01
306.0	3512.956	20.789	332.485	-100.3	193.8	12251.4	-22.21	-0.07	31.17
308.0	3512.916	20.852	336.528	-144.8	193.6	12313.9	-22.22	-0.06	31.33
310.0	3512.861	20.916	340.592	-189.3	193.5	12376.8	-22.25	-0.05	31.50
312.0	3512.791	20.980	344.676	-233.9	193.4	12439.9	-22.29	-0.06	31.65
314.0	3512.707	21.043	348.781	-278.6	193.2	12503.4	-22.32	-0.07	31.81
316.0	3512.608	21.107	352.907	-323.3	193.1	12567.2	-22.35	-0.05	31.99
318.0	3512.494	21.170	357.055	-368.1	192.9	12631.3	-22.40	-0.05	32.16
320.0	3512.365	21.234	361.223	-413.0	192.8	12695.9	-22.45	-0.06	32.34
322.0	3512.222	21.297	365.413	-457.9	192.7	12760.7	-22.48	-0.07	32.50
324.0	3512.064	21.361	369.624	-503.0	192.5	12825.9	-22.51	-0.07	32.67
326.0	3511.891	21.424	373.856	-548.1	192.3	12891.4	-22.55	-0.07	32.84
328.0	3511.703	21.487	378.110	-593.3	192.2	12957.3	-22.60	-0.07	33.04
330.0	3511.500	21.551	382.386	-638.5	192.0	13023.6	-22.63	-0.07	33.22
332.0	3511.283	21.614	386.684	-683.9	191.8	13090.2	-22.65	-0.07	33.39
334.0	3511.050	21.677	391.004	-729.3	191.7	13157.2	-22.69	-0.07	33.56
336.0	3510.803	21.740	395.345	-774.7	191.5	13224.5	-22.75	-0.07	33.76
338.0	3510.540	21.803	399.710	-820.4	191.3	13292.3	-22.82	-0.07	33.98
340.0	3510.263	21.866	404.096	-866.1	191.2	13360.4	-22.86	-0.06	34.16
342.0	3509.970	21.929	408.505	-911.9	191.0	13428.9	-22.90	-0.06	34.34
344.0	3509.662	21.992	412.936	-957.8	190.9	13497.8	-22.95	-0.07	34.53
346.0	3509.339	22.055	417.391	-1003.8	190.7	13567.1	-23.01	-0.08	34.73
348.0	3509.001	22.117	421.868	-1049.9	190.6	13636.8	-23.07	-0.07	34.95
350.0	3508.648	22.180	426.368	-1096.2	190.4	13706.9	-23.12	-0.05	35.15

TABLE C-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XS NM	YS NM	ZS NM	DXS FT/S	DYS FT/S	DZS FT/S	DOXS FT/S SQ	DOYS FT/S SQ	DOZS FT/S SQ
352.0	3508.280	22.243	430.891	-1142.5	190.3	13777.4	-23.16	-0.04	35.35
354.0	3507.896	22.305	435.438	-1188.9	190.2	13848.3	-23.20	-0.05	35.54
356.0	3507.497	22.368	440.008	-1235.9	190.1	13919.6	-23.23	-0.05	35.76
358.0	3507.083	22.430	444.602	-1281.9	189.9	13991.4	-23.28	-0.05	35.98
360.0	3506.653	22.493	449.219	-1328.6	189.8	14063.6	-23.34	-0.03	36.19
362.0	3506.208	22.555	453.860	-1375.4	189.8	14136.2	-23.43	-0.02	36.41
364.0	3505.748	22.618	458.525	-1422.4	189.7	14209.2	-23.52	-0.02	36.63
366.0	3505.272	22.680	463.214	-1469.5	189.6	14282.7	-23.57	-0.05	36.85
368.0	3504.780	22.743	467.928	-1516.8	189.5	14356.7	-23.63	-0.08	37.09
370.0	3504.273	22.805	472.665	-1564.1	189.3	14431.1	-23.69	-0.09	37.29
372.0	3503.751	22.867	477.428	-1611.6	189.1	14505.9	-23.75	-0.08	37.53
374.0	3503.212	22.929	482.215	-1659.2	188.9	14581.2	-23.82	-0.06	37.77
376.0	3502.658	22.992	487.027	-1707.0	188.8	14657.0	-23.91	-0.05	38.01
378.0	3502.089	23.054	491.864	-1755.0	188.7	14733.3	-23.99	-0.05	38.26
380.0	3501.503	23.116	496.726	-1803.1	188.5	14810.0	-24.06	-0.05	38.50
382.0	3500.902	23.178	501.614	-1851.3	188.4	14887.3	-24.13	-0.06	38.74
384.0	3500.284	23.240	506.527	-1899.7	188.3	14965.0	-24.21	-0.05	38.99
386.0	3499.651	23.302	511.465	-1948.2	188.2	15043.3	-24.29	-0.05	39.24
388.0	3499.002	23.364	516.430	-1996.9	188.0	15122.0	-24.35	-0.07	39.51
390.0	3498.336	23.426	521.420	-2045.8	187.8	15201.3	-24.43	-0.09	39.77
392.0	3497.655	23.487	526.437	-2094.7	187.6	15281.1	-24.50	-0.09	40.01
394.0	3496.957	23.549	531.480	-2143.9	187.4	15361.4	-24.58	-0.07	40.28
396.0	3496.244	23.611	536.550	-2193.2	187.3	15442.3	-24.69	-0.07	40.57
398.0	3495.513	23.672	541.646	-2242.7	187.1	15523.7	-24.80	-0.11	40.85
400.0	3494.767	23.734	546.770	-2292.5	186.8	15605.7	-24.90	-0.12	41.12
402.0	3494.004	23.795	551.920	-2342.4	186.5	15688.3	-24.96	-0.12	41.40
404.0	3493.225	23.857	557.097	-2392.4	186.3	15771.3	-25.03	-0.12	41.66
406.0	3492.429	23.918	562.302	-2442.6	186.0	15854.9	-25.13	-0.12	41.95
408.0	3491.617	23.979	567.535	-2493.0	185.7	15939.2	-25.22	-0.12	42.24
410.0	3490.788	24.040	572.795	-2543.7	185.5	16024.0	-25.33	-0.13	42.56
412.0	3489.942	24.101	578.084	-2594.5	185.2	16109.4	-25.45	-0.14	42.87
414.0	3489.080	24.162	583.401	-2645.5	184.9	16195.5	-25.55	-0.12	43.17
416.0	3488.201	24.223	588.746	-2696.8	184.6	16282.1	-25.63	-0.09	43.46
418.0	3487.305	24.284	594.119	-2748.2	184.4	16369.4	-25.70	-0.09	43.77
420.0	3486.392	24.344	599.522	-2799.7	184.2	16457.2	-25.80	-0.11	44.10
422.0	3485.462	24.405	604.954	-2851.5	184.0	16545.8	-25.92	-0.13	44.43
424.0	3484.514	24.465	610.414	-2903.5	183.7	16635.0	-26.06	-0.13	44.75
426.0	3483.550	24.526	615.905	-2955.8	183.4	16724.8	-26.18	-0.12	45.08
428.0	3482.569	24.586	621.425	-3008.3	183.1	16815.3	-26.28	-0.13	45.43
430.0	3481.570	24.646	626.975	-3061.1	182.8	16906.5	-26.38	-0.14	45.78
432.0	3480.553	24.707	632.555	-3114.0	182.5	16998.4	-26.49	-0.14	46.11
434.0	3479.520	24.767	638.165	-3167.1	182.2	17091.0	-26.60	-0.12	46.44
436.0	3478.468	24.827	643.806	-3220.5	182.0	17184.3	-26.73	-0.11	46.80

TABLE C-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XS NM	YS NM	ZS NM	DXS FT/S	DYS FT/S	OZS FT/S	DDXS FT/S SQ	DDYS FT/S SQ	DDZS FT/S SQ
S-II CENTER ENGINE CUTOFF (ENGINE SOLENOID)									
438.0	3477.399	24.886	649.478	-3274.2	181.7	17278.2	-26.88	-0.12	47.17
440.0	3476.313	24.946	655.181	-3328.1	181.4	17373.0	-27.00	-0.13	47.55
442.0	3475.209	25.006	660.915	-3382.3	181.2	17468.5	-27.12	-0.13	47.93
444.0	3474.086	25.065	666.680	-3436.7	180.9	17564.7	-27.23	-0.13	48.31
446.0	3472.946	25.125	672.478	-3491.3	180.6	17661.8	-27.35	-0.13	48.70
448.0	3471.788	25.184	678.307	-3546.2	180.3	17759.5	-27.48	-0.13	49.08
450.0	3470.612	25.244	684.169	-3601.4	180.0	17858.1	-27.61	-0.13	49.47
452.0	3469.417	25.303	690.064	-3656.8	179.7	17957.5	-27.74	-0.13	49.87
454.0	3468.204	25.362	695.991	-3712.5	179.4	18057.6	-27.91	-0.12	50.28
456.0	3466.973	25.421	701.952	-3768.5	179.2	18158.6	-28.06	-0.11	50.69
458.0	3465.723	25.480	707.945	-3824.8	178.8	18260.3	-28.19	-0.15	51.09
459.560	3464.736	25.526	712.644	-3868.9	178.5	18340.2	-28.29	-0.24	51.41
460.0	3464.455	25.539	713.973	-3881.4	178.4	18360.6	-28.39	-0.14	40.95
462.0	3463.168	25.597	720.029	-3938.8	177.9	18441.3	-28.81	-0.31	40.35
464.0	3461.862	25.656	726.113	-3996.5	177.2	18522.1	-28.88	-0.35	40.52
466.0	3460.537	25.714	732.223	-4054.2	176.5	18603.4	-28.77	-0.27	40.70
468.0	3459.193	25.772	738.360	-4111.5	176.0	18685.0	-28.44	-0.25	40.94
470.0	3457.831	25.830	744.524	-4167.7	175.5	18767.1	-27.55	-0.25	41.19
472.0	3456.450	25.887	750.715	-4221.5	175.0	18849.8	-26.20	-0.23	41.46
474.0	3455.052	25.945	756.933	-4272.8	174.4	18933.8	-25.08	-0.35	41.73
476.0	3453.637	26.002	763.179	-4322.6	173.7	19017.5	-24.79	-0.25	42.01
478.0	3452.206	26.059	769.453	-4372.4	173.2	19101.8	-24.98	-0.24	42.25
480.0	3450.759	26.116	775.754	-4422.6	172.6	19186.5	-25.19	-0.34	42.48
482.0	3449.294	26.173	782.084	-4473.2	172.1	19271.7	-25.38	-0.15	42.72
484.0	3447.813	26.230	788.442	-4524.2	171.6	19357.4	-25.54	-0.28	42.99
486.0	3446.315	26.286	794.826	-4576.8	171.1	19433.5	-26.83	-0.26	37.10
488.0	3444.800	26.342	801.235	-4631.1	170.6	19507.6	-27.24	-0.17	37.09
490.0	3443.266	26.398	807.669	-4685.9	170.3	19581.9	-27.48	-0.17	37.23
492.0	3441.715	26.454	814.127	-4741.1	169.9	19656.5	-27.65	-0.17	37.40
494.0	3440.145	26.510	820.609	-4796.6	169.5	19732.2	-27.87	-0.17	37.60
496.0	3438.557	26.566	827.117	-4852.7	169.1	19807.6	-28.19	-0.17	37.82
498.0	3436.950	26.621	833.649	-4909.6	168.8	19883.5	-28.70	-0.16	38.04
500.0	3435.325	26.677	840.207	-4967.8	168.4	19959.8	-29.33	-0.15	38.28
502.0	3433.680	26.732	846.789	-5026.9	168.1	20036.7	-29.81	-0.13	38.54
504.0	3432.015	26.788	853.397	-5086.9	167.8	20114.0	-30.05	-0.11	38.76
506.0	3430.331	26.843	860.031	-5147.2	167.6	20191.8	-30.20	-0.11	38.98
508.0	3428.627	26.898	866.690	-5207.9	167.3	20270.0	-30.39	-0.12	39.24
510.0	3426.903	26.953	873.375	-5269.0	167.0	20348.8	-30.63	-0.14	39.52
512.0	3425.158	27.008	880.086	-5330.5	166.7	20428.1	-30.81	-0.15	39.79
514.0	3423.394	27.063	886.823	-5392.3	166.4	20507.9	-30.95	-0.15	40.03

TABLE C-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XS NM	YS NM	ZS NM	DXS FT/S	DYS FT/S	DZS FT/S	DOXS FT/S SQ	DOYS FT/S SQ	DOZS FT/S SQ
S-II OUTBOARD ENGINE CUTOFF (ENGINE SOLENOID)									
549.060	3389.047	28.008	1009.368	-6529.0	160.8	22000.7	-33.83	-0.65	45.79
550.0	3388.035	28.033	1012.769	-6558.8	160.8	22005.5	-28.96	0.20	-11.32
S-II/S-IVB SEPARATION COMMAND									
550.100	3387.927	28.035	1013.131	-6561.7	160.8	22004.4	-28.96	0.17	-11.32
552.0	3385.867	28.086	1020.007	-6616.8	160.7	21982.9	-28.96	-0.17	-11.33
554.0	3383.680	28.138	1027.239	-6674.9	160.3	21961.6	-29.30	-0.28	-5.90
556.0	3381.473	28.191	1034.467	-6735.0	159.5	21966.5	-30.44	-0.34	6.84
558.0	3379.247	28.244	1041.700	-6796.1	158.9	21981.5	-30.50	-0.26	7.77
560.0	3377.000	28.296	1048.938	-6857.3	158.3	21996.9	-30.73	-0.35	7.92
562.0	3374.733	28.348	1056.181	-6919.3	157.5	22012.7	-31.15	-0.38	8.06
564.0	3372.445	28.399	1063.429	-6981.1	156.7	22028.9	-31.30	-0.38	8.04
566.0	3370.137	28.451	1070.683	-7043.8	155.9	22045.0	-31.26	-0.34	8.09
568.0	3367.808	28.502	1077.942	-7106.3	155.2	22061.2	-31.21	-0.32	8.10
570.0	3365.459	28.553	1085.206	-7168.9	154.6	22077.5	-31.30	-0.30	8.11
572.0	3363.089	28.604	1092.476	-7231.8	154.0	22093.7	-31.48	-0.26	8.10
574.0	3360.698	28.654	1099.751	-7294.9	153.5	22109.9	-31.61	-0.22	8.06
576.0	3358.286	28.705	1107.031	-7358.3	153.0	22126.0	-31.69	-0.19	8.01
578.0	3355.854	28.755	1114.317	-7421.8	152.7	22142.0	-31.75	-0.15	7.97
580.0	3353.401	28.805	1121.608	-7485.4	152.3	22157.9	-31.81	-0.13	7.93
582.0	3350.926	28.855	1128.904	-7549.2	152.0	22173.7	-31.85	-0.13	7.89
584.0	3348.431	28.905	1136.205	-7613.0	151.7	22189.6	-31.89	-0.13	7.89

TABLE C-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XS NM	YS NM	ZS NM	DXS FT/S	DYS FT/S	DZS FT/S	DDXS FT/S SQ	DDYS FT/S SQ	DDZS FT/S SQ
586.0	3345.914	28.955	1143.511	-7676.9	151.4	22205.4	-31.93	-0.12	7.90
588.0	3343.377	29.005	1150.823	-7740.9	151.2	22221.2	-31.94	-0.10	7.90
590.0	3340.818	29.055	1158.140	-7804.8	150.9	22237.0	-31.92	-0.11	7.89
592.0	3338.239	29.105	1165.462	-7868.7	150.7	22252.8	-31.91	-0.10	7.88
594.0	3335.638	29.154	1172.789	-7932.6	150.4	22268.5	-31.95	-0.09	7.86
596.0	3333.017	29.204	1180.122	-7996.7	150.3	22284.3	-32.02	-0.06	7.85
598.0	3330.374	29.253	1187.459	-8060.9	150.1	22300.0	-32.08	-0.06	7.86
600.0	3327.710	29.302	1194.802	-8125.1	149.9	22315.8	-32.12	-0.07	7.85
602.0	3325.025	29.352	1202.150	-8189.5	149.7	22331.4	-32.15	-0.08	7.80
604.0	3322.319	29.401	1209.503	-8253.9	149.5	22347.0	-32.20	-0.08	7.75
606.0	3319.591	29.450	1216.862	-8318.4	149.3	22362.5	-32.23	-0.08	7.72
608.0	3316.843	29.499	1224.225	-8383.0	149.1	22377.9	-32.24	-0.09	7.69
610.0	3314.073	29.548	1231.593	-8447.6	148.9	22393.3	-32.25	-0.09	7.64
612.0	3311.282	29.597	1238.967	-8512.1	148.7	22408.5	-32.26	-0.08	7.60
614.0	3308.469	29.646	1246.345	-8576.8	148.5	22423.8	-32.28	-0.08	7.62
616.0	3305.635	29.695	1253.729	-8641.4	148.3	22439.1	-32.27	-0.08	7.66
618.0	3302.780	29.744	1261.117	-8706.0	148.1	22454.5	-32.25	-0.08	7.68
620.0	3299.904	29.792	1268.511	-8770.6	147.8	22469.8	-32.27	-0.10	7.65
622.0	3297.006	29.841	1275.910	-8835.3	147.6	22485.1	-32.31	-0.14	7.58
624.0	3294.088	29.890	1283.313	-8900.0	147.3	22500.2	-32.36	-0.15	7.51
626.0	3291.147	29.938	1290.722	-8964.9	146.9	22515.2	-32.40	-0.15	7.49
628.0	3288.186	29.986	1298.135	-9029.8	146.6	22530.2	-32.45	-0.14	7.47
630.0	3285.203	30.034	1305.554	-9094.8	146.2	22545.2	-32.49	-0.14	7.46
632.0	3282.199	30.083	1312.977	-9159.9	145.9	22560.1	-32.48	-0.15	7.43
634.0	3279.173	30.131	1320.405	-9224.9	145.6	22575.0	-32.45	-0.14	7.42
636.0	3276.126	30.178	1327.839	-9289.9	145.3	22589.8	-32.42	-0.14	7.43
638.0	3273.057	30.226	1335.277	-9354.8	144.9	22604.7	-32.40	-0.15	7.40
640.0	3269.967	30.274	1342.720	-9419.7	144.5	22619.5	-32.41	-0.18	7.35
642.0	3266.856	30.321	1350.167	-9484.6	144.1	22634.2	-32.44	-0.20	7.32
644.0	3263.723	30.369	1357.620	-9549.6	143.7	22648.8	-32.49	-0.18	7.33
646.0	3260.569	30.416	1365.077	-9614.8	143.3	22663.5	-32.53	-0.17	7.34
648.0	3257.394	30.463	1372.540	-9679.9	142.9	22678.2	-32.54	-0.19	7.33
650.0	3254.197	30.510	1380.007	-9745.1	142.5	22692.9	-32.54	-0.21	7.29
652.0	3250.979	30.557	1387.479	-9810.2	142.0	22707.5	-32.54	-0.21	7.28
654.0	3247.739	30.603	1394.955	-9875.4	141.5	22722.0	-32.56	-0.21	7.25
656.0	3244.477	30.650	1402.437	-9940.7	141.1	22736.5	-32.60	-0.21	7.22
658.0	3241.195	30.696	1409.923	-10006.0	140.6	22750.9	-32.62	-0.21	7.20
660.0	3237.890	30.743	1417.414	-10071.3	139.6	22765.4	-32.62	-0.22	7.21
662.0	3234.565	30.789	1424.910	-10136.6	139.1	22779.8	-32.61	-0.25	7.23
664.0	3231.217	30.834	1432.411	-10202.0	138.5	22794.3	-32.66	-0.26	7.24
666.0	3227.848	30.880	1439.916	-10267.5	138.5	22808.8	-32.78	-0.26	7.22
668.0	3224.458	30.926	1447.426	-10333.3	137.9	22823.2	-32.90	-0.26	7.17
670.0	3221.046	30.971	1454.941	-10399.2	137.3	22837.6	-32.93	-0.27	7.12

TABLE C-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS - ASCENT PHASE (CONT.)

TIME SEC	XS NM	YS NM	ZS NM	DXS FT/S	DYS FT/S	DZS FT/S	DDXS FT/S SQ	DDYS FT/S SQ	DDZS FT/S SQ
672.0	3217.612	31.016	1462.460	-10465.1	136.8	22851.8	-32.85	-0.25	7.12
674.0	3214.156	31.061	1469.985	-10530.8	136.2	22866.1	-32.75	-0.24	7.13
676.0	3210.679	31.106	1477.513	-10596.4	135.7	22880.4	-32.72	-0.25	7.12
678.0	3207.181	31.150	1485.047	-10661.9	135.1	22894.6	-32.76	-0.26	7.10
680.0	3203.660	31.195	1492.585	-10727.6	134.5	22908.8	-32.80	-0.27	7.07
682.0	3200.119	31.239	1500.128	-10793.3	134.0	22923.0	-32.78	-0.26	7.07
684.0	3196.555	31.283	1507.676	-10858.9	133.4	22937.2	-32.72	-0.27	7.08
686.0	3192.970	31.327	1515.228	-10924.3	132.8	22951.4	-32.66	-0.27	7.08
688.0	3189.363	31.370	1522.785	-10989.8	132.2	22965.5	-32.62	-0.21	7.05
690.0	3185.735	31.414	1530.347	-11055.1	131.6	22979.6	-32.57	-0.21	7.05
692.0	3182.086	31.457	1537.913	-11120.2	131.0	22993.7	-32.52	-0.39	7.03
694.0	3178.415	31.500	1545.484	-11185.3	130.4	23007.8	-32.48	-0.31	7.02
S-IVB 1ST GUIDANCE CUTOFF									
694.670	3177.180	31.514	1548.021	-11207.1	130.1	23012.5	-32.46	-0.51	7.01
696.0	3174.722	31.543	1553.058	-11245.0	129.8	23000.5	-27.38	-0.20	-13.49
698.0	3171.012	31.585	1560.624	-11299.8	129.3	22973.4	-27.34	-0.21	-13.54
700.0	3167.283	31.628	1568.181	-11355.0	128.9	22946.4	-27.31	-0.21	-13.43
702.0	3163.537	31.670	1575.730	-11409.7	128.4	22919.3	-27.27	-0.21	-13.65
704.0	3159.772	31.712	1583.270	-11464.3	127.9	22892.1	-27.25	-0.21	-13.68
PARKING ORBIT INSERTION									
704.670	3158.507	31.726	1585.793	-11482.6	127.8	22882.9	-27.24	-0.21	-13.71

TABLE C-III. GEOGRAPHIC POLAR COORDINATES - ASCENT PHASE

TIME SEC	GC DIST NM	LONG DEG E	GC LAT DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
GUIDANCE REFERENCE RELEASE											
-16.939	3441.364	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	1340.7	0.0	366
-16.0	3441.364	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	1340.7	0.0	366
-15.0	3441.364	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	1340.7	0.0	366
-14.0	3441.364	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	1340.7	0.0	366
-13.0	3441.364	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	1340.7	0.0	366
-12.0	3441.364	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	1340.7	0.0	366
-11.0	3441.364	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	1340.7	0.0	366
-10.0	3441.364	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	1340.7	0.0	366
-9.0	3441.364	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	1340.7	0.0	366
-8.0	3441.364	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	1340.7	0.0	366
-7.0	3441.364	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	1340.7	0.0	366
-6.0	3441.364	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	1340.7	0.0	366
-5.0	3441.364	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	1340.7	0.0	366
-4.0	3441.364	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	1340.7	0.0	366
-3.0	3441.364	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	1340.7	0.0	366
-2.0	3441.364	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	1340.7	0.0	366
-1.0	3441.364	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	1340.7	0.0	366
0.0	3441.364	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	1340.7	0.0	366
ALL HOLDDOWN ARMS RELEASED											
0.300	3441.364	-80.6041	28.4470	0.0	90.00	0.5	90.00	0.02	1340.7	0.0	366
LIFTOFF - START OF TIME BASE 1											
0.600	3441.365	-80.6041	28.4470	301.25	89.47	1.5	90.00	0.07	1340.7	0.000	367
1.0	3441.365	-80.6041	28.4470	257.34	89.51	3.7	90.00	0.16	1340.7	0.000	368
2.0	3441.366	-80.6041	28.4470	220.90	88.99	11.3	90.01	0.49	1340.6	-0.000	375
3.0	3441.368	-80.6041	28.4470	207.95	88.80	19.2	90.02	0.82	1340.6	-0.000	390
4.0	3441.372	-80.6041	28.4470	201.71	88.56	27.1	90.03	1.16	1340.7	-0.000	414
5.0	3441.377	-80.6041	28.4470	195.74	88.30	35.2	90.04	1.51	1340.9	-0.000	445
6.0	3441.384	-80.6041	28.4470	193.05	88.10	43.6	90.06	1.86	1341.1	0.000	484
7.0	3441.392	-80.6041	28.4470	190.63	87.79	52.1	90.08	2.22	1341.3	0.000	532
8.0	3441.401	-80.6041	28.4469	188.23	87.20	60.8	90.13	2.60	1341.7	0.001	588
9.0	3441.412	-80.6041	28.4469	186.51	86.78	69.8	90.17	2.98	1342.1	0.001	653
10.0	3441.424	-80.6041	28.4469	185.48	86.68	79.1	90.20	3.37	1342.6	0.002	728
11.0	3441.438	-80.6041	28.4469	184.47	86.82	88.7	90.21	3.78	1343.3	0.003	811
12.0	3441.453	-80.6041	28.4469	182.88	87.05	98.5	90.22	4.20	1344.1	0.004	905
13.0	3441.470	-80.6041	28.4469	180.42	87.23	108.4	90.22	4.62	1345.1	0.005	1008
14.0	3441.489	-80.6041	28.4469	177.33	87.34	118.3	90.23	5.04	1346.2	0.005	1121

TABLE C-III. GEOGRAPHIC POLAR COORDINATES - ASCENT PHASE (CONT.)

TIME SEC	GC DIST NM	LONG DEG E	GC LAT DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
15.0	3441.509	-80.6041	28.4469	173.89	87.46	128.5	90.24	5.47	1347.5	0.006	1245
16.0	3441.531	-80.6041	28.4468	170.34	87.63	138.9	90.24	5.90	1348.9	0.007	1378
17.0	3441.555	-80.6041	28.4468	166.18	87.87	149.5	90.23	6.35	1350.4	0.008	1522
18.0	3441.580	-80.6041	28.4468	160.38	88.12	160.3	90.21	6.81	1352.1	0.009	1677
19.0	3441.607	-80.6041	28.4468	152.71	88.29	171.4	90.19	7.27	1354.0	0.010	1843
20.0	3441.637	-80.6041	28.4468	144.19	88.38	182.7	90.18	7.74	1356.2	0.011	2020
21.0	3441.668	-80.6041	28.4468	135.56	88.42	194.2	90.16	8.22	1358.5	0.011	2208
22.0	3441.701	-80.6041	28.4468	127.15	88.38	206.0	90.15	8.70	1361.1	0.012	2408
23.0	3441.735	-80.6041	28.4468	119.01	88.29	218.1	90.13	9.19	1364.1	0.013	2620
24.0	3441.772	-80.6041	28.4467	111.95	88.14	230.4	90.12	9.69	1367.3	0.013	2844
25.0	3441.811	-80.6040	28.4467	105.87	87.96	242.9	90.10	10.20	1370.9	0.014	3080
26.0	3441.852	-80.6040	28.4467	100.72	87.73	255.7	90.08	10.71	1374.8	0.015	3329
27.0	3441.895	-80.6040	28.4467	96.45	87.47	268.8	90.06	11.23	1379.1	0.016	3591
28.0	3441.941	-80.6039	28.4467	93.02	87.16	282.2	90.03	11.75	1383.9	0.018	3867
29.0	3441.988	-80.6039	28.4467	90.26	86.83	295.8	90.00	12.28	1389.1	0.019	4155
30.0	3442.038	-80.6038	28.4467	88.09	86.47	309.7	89.97	12.81	1394.7	0.021	4457
31.0	3442.090	-80.6038	28.4467	86.34	86.08	324.0	89.94	13.34	1400.9	0.024	4774
32.0	3442.144	-80.6037	28.4467	84.92	85.66	338.5	89.90	13.88	1407.6	0.027	5104
33.0	3442.201	-80.6036	28.4467	83.77	85.23	353.4	89.87	14.41	1414.8	0.031	5449
34.0	3442.260	-80.6035	28.4468	82.85	84.77	368.6	89.83	14.95	1422.6	0.035	5808
35.0	3442.322	-80.6034	28.4468	82.10	84.29	384.1	89.78	15.49	1430.9	0.040	6183
36.0	3442.386	-80.6033	28.4468	81.51	83.79	400.0	89.74	16.03	1439.9	0.047	6573
37.0	3442.453	-80.6031	28.4468	81.05	83.27	416.2	89.69	16.57	1449.5	0.054	6979
38.0	3442.522	-80.6030	28.4468	80.69	82.74	432.8	89.64	17.10	1459.7	0.062	7400
39.0	3442.594	-80.6028	28.4468	80.39	82.18	449.7	89.58	17.64	1470.6	0.071	7837
40.0	3442.669	-80.6026	28.4469	80.15	81.61	467.0	89.53	18.16	1482.2	0.081	8291
41.0	3442.746	-80.6024	28.4469	79.95	81.03	484.7	89.47	18.69	1494.5	0.093	8761
42.0	3442.826	-80.6021	28.4469	79.78	80.43	502.8	89.40	19.20	1507.5	0.106	9249
43.0	3442.909	-80.6019	28.4470	79.63	79.81	521.4	89.34	19.71	1521.3	0.120	9753
44.0	3442.995	-80.6016	28.4471	79.51	79.17	540.3	89.27	20.21	1535.8	0.136	10275
45.0	3443.084	-80.6012	28.4471	79.41	78.53	559.7	89.19	20.71	1551.1	0.153	10815
46.0	3443.176	-80.6009	28.4472	79.32	77.87	579.5	89.11	21.19	1567.2	0.172	11372
47.0	3443.271	-80.6005	28.4472	79.26	77.19	599.7	89.04	21.66	1584.1	0.193	11948
48.0	3443.368	-80.6001	28.4473	79.23	76.51	620.4	88.96	22.12	1601.8	0.215	12542
49.0	3443.469	-80.5996	28.4474	79.21	75.82	641.6	88.87	22.57	1620.3	0.240	13155
50.0	3443.573	-80.5991	28.4474	79.22	75.12	663.2	88.79	23.01	1639.6	0.267	13786
51.0	3443.680	-80.5986	28.4475	79.24	74.42	685.4	88.71	23.44	1659.8	0.296	14437
52.0	3443.790	-80.5980	28.4476	79.28	73.70	708.0	88.62	23.85	1680.8	0.327	15107
53.0	3443.904	-80.5973	28.4477	79.32	72.99	731.2	88.54	24.25	1702.6	0.361	15797
54.0	3444.021	-80.5967	28.4479	79.37	72.27	755.0	88.45	24.63	1725.3	0.398	16506
55.0	3444.141	-80.5959	28.4480	79.42	71.54	779.2	88.36	25.00	1748.8	0.437	17235
56.0	3444.264	-80.5952	28.4481	79.47	70.82	804.1	88.27	25.36	1773.1	0.479	17984
57.0	3444.391	-80.5943	28.4482	79.50	70.09	829.5	88.18	25.70	1798.3	0.524	18754



TABLE C-III. GEOGRAPHIC POLAR COORDINATES - ASCENT PHASE (CONT.)

TIME SEC	GC DIST NM	LONG DEG E	GC LAT DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
58.0	3444.521	-80.5934	28.4484	79.53	69.36	855.4	88.09	26.03	1824.3	0.572	19545
59.0	3444.654	-80.5925	28.4485	79.55	68.63	881.9	87.99	26.34	1851.2	0.623	20356
60.0	3444.791	-80.5915	28.4487	79.56	67.90	909.0	87.88	26.63	1878.8	0.677	21187
61.0	3444.931	-80.5904	28.4489	79.56	67.17	936.6	87.78	26.91	1907.2	0.735	22040
62.0	3445.075	-80.5892	28.4491	79.56	66.44	964.7	87.68	27.17	1936.4	0.797	22914
63.0	3445.222	-80.5880	28.4493	79.56	65.72	993.3	87.57	27.42	1966.3	0.862	23809
64.0	3445.373	-80.5867	28.4495	79.56	65.00	1022.4	87.46	27.65	1996.9	0.931	24725
MACH 1											
65.000	3445.527	-80.5854	28.4497	79.58	64.29	1052.0	87.36	27.86	2028.1	1.004	25663
66.0	3445.685	-80.5839	28.4499	79.60	63.59	1082.1	87.26	28.06	2060.1	1.081	26622
67.0	3445.846	-80.5824	28.4502	79.62	62.89	1112.8	87.16	28.25	2092.8	1.162	27602
68.0	3446.011	-80.5808	28.4504	79.65	62.19	1144.0	87.06	28.42	2126.1	1.248	28603
69.0	3446.179	-80.5792	28.4507	79.68	61.51	1175.9	86.96	28.58	2160.3	1.338	29626
70.0	3446.351	-80.5774	28.4510	79.71	60.82	1208.5	86.87	28.73	2195.3	1.432	30671
71.0	3446.527	-80.5755	28.4513	79.73	60.15	1241.8	86.77	28.86	2231.1	1.532	31737
72.0	3446.706	-80.5736	28.4516	79.74	59.48	1275.9	86.67	28.99	2267.8	1.636	32825
73.0	3446.889	-80.5716	28.4519	79.76	58.82	1310.8	86.57	29.11	2305.3	1.744	33936
74.0	3447.075	-80.5695	28.4522	79.77	58.18	1346.5	86.47	29.22	2343.6	1.859	35069
75.0	3447.265	-80.5672	28.4526	79.78	57.54	1383.0	86.37	29.32	2382.8	1.978	36225
76.0	3447.459	-80.5649	28.4530	79.80	56.92	1420.3	86.27	29.42	2422.8	2.102	37404
77.0	3447.657	-80.5625	28.4533	79.82	56.31	1458.4	86.18	29.51	2463.6	2.233	38606
78.0	3447.858	-80.5600	28.4537	79.85	55.70	1497.2	86.09	29.59	2505.3	2.368	39832
79.0	3448.064	-80.5573	28.4542	79.89	55.11	1536.9	86.00	29.66	2547.8	2.510	41081
80.0	3448.273	-80.5546	28.4546	79.94	54.52	1577.4	85.92	29.71	2591.3	2.657	42354
81.0	3448.487	-80.5517	28.4550	79.99	53.92	1618.8	85.85	29.76	2635.7	2.811	43651
MAXIMUM DYNAMIC PRESSURE											
82.000	3448.704	-80.5487	28.4555	80.04	53.33	1661.1	85.77	29.80	2681.3	2.970	44971
83.0	3448.925	-80.5456	28.4560	80.08	52.73	1704.3	85.69	29.81	2727.8	3.137	46316
84.0	3449.151	-80.5424	28.4565	80.12	52.13	1748.4	85.61	29.82	2775.5	3.309	47685
85.0	3449.380	-80.5390	28.4570	80.15	51.52	1793.6	85.53	29.81	2824.4	3.489	49078
86.0	3449.613	-80.5356	28.4575	80.17	50.92	1839.6	85.45	29.79	2874.3	3.676	50494
87.0	3449.850	-80.5319	28.4581	80.18	50.30	1886.7	85.36	29.75	2925.2	3.870	51935
88.0	3450.091	-80.5282	28.4586	80.19	49.69	1934.7	85.27	29.71	2977.2	4.072	53399
89.0	3450.335	-80.5243	28.4592	80.19	49.09	1983.7	85.18	29.65	3030.2	4.281	54887
90.0	3450.584	-80.5202	28.4598	80.20	48.49	2033.6	85.09	29.59	3084.2	4.498	56398
91.0	3450.837	-80.5160	28.4605	80.20	47.90	2084.5	85.00	29.52	3139.2	4.723	57934
92.0	3451.093	-80.5117	28.4611	80.20	47.32	2136.5	84.92	29.44	3195.1	4.957	59493
93.0	3451.354	-80.5071	28.4618	80.20	46.75	2189.4	84.83	29.37	3252.0	5.199	61076
94.0	3451.618	-80.5025	28.4625	80.21	46.20	2243.3	84.75	29.29	3309.8	5.449	62684

TABLE C-III. GEOGRAPHIC POLAR COORDINATES - ASCENT PHASE (CONT.)

TIME SEC	GC DIST NM	LONG DEG E	GC LAT DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL FT/S	HEAD DEG	FLY-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
95.0	3451.886	-80.4976	28.4633	80.21	45.65	2298.3	84.67	29.20	3368.5	5.708	64316
96.0	3452.159	-80.4926	28.4640	80.20	45.12	2354.2	84.58	29.12	3428.2	5.977	65973
97.0	3452.436	-80.4875	28.4648	80.20	44.59	2411.1	84.50	29.03	3488.9	6.254	67654
98.0	3452.716	-80.4821	28.4656	80.19	44.07	2469.1	84.42	28.93	3550.5	6.540	69360
99.0	3453.001	-80.4766	28.4665	80.18	43.58	2528.0	84.34	28.83	3613.1	6.836	71091
100.0	3453.290	-80.4709	28.4673	80.17	43.07	2588.0	84.26	28.73	3676.8	7.141	72846
101.0	3453.583	-80.4650	28.4682	80.17	42.57	2649.1	84.18	28.62	3741.4	7.456	74627
102.0	3453.880	-80.4590	28.4691	80.16	42.09	2711.2	84.10	28.51	3807.1	7.781	76433
103.0	3454.181	-80.4527	28.4701	80.16	41.61	2774.3	84.03	28.40	3873.8	8.116	78263
104.0	3454.486	-80.4463	28.4711	80.17	41.14	2838.5	83.96	28.28	3941.5	8.461	80119
105.0	3454.795	-80.4396	28.4721	80.17	40.68	2903.8	83.90	28.16	4010.3	8.817	82000
106.0	3455.109	-80.4328	28.4731	80.18	40.22	2970.0	83.84	28.04	4080.0	9.183	83907
107.0	3455.427	-80.4257	28.4742	80.19	39.78	3037.4	83.78	27.92	4150.7	9.560	85838
108.0	3455.749	-80.4185	28.4753	80.20	39.34	3105.8	83.72	27.80	4222.4	9.948	87796
109.0	3456.075	-80.4111	28.4764	80.21	38.92	3175.3	83.66	27.67	4295.1	10.348	89779
110.0	3456.405	-80.4034	28.4776	80.22	38.51	3245.9	83.60	27.55	4368.8	10.758	91788
111.0	3456.740	-80.3955	28.4788	80.23	38.10	3317.6	83.55	27.43	4443.6	11.180	93823
112.0	3457.079	-80.3874	28.4800	80.23	37.71	3390.4	83.49	27.31	4519.5	11.614	95885
113.0	3457.423	-80.3791	28.4813	80.24	37.33	3464.4	83.44	27.20	4596.4	12.059	97973
114.0	3457.771	-80.3706	28.4826	80.24	36.95	3539.6	83.39	27.08	4674.4	12.516	100089
115.0	3458.123	-80.3618	28.4839	80.25	36.58	3615.8	83.34	26.96	4753.5	12.986	102232
116.0	3458.480	-80.3528	28.4852	80.26	36.22	3693.2	83.29	26.84	4833.7	13.467	104401
117.0	3458.841	-80.3436	28.4866	80.27	35.86	3771.8	83.24	26.72	4915.0	13.962	106599
118.0	3459.207	-80.3341	28.4881	80.27	35.51	3851.5	83.19	26.59	4997.5	14.469	108824
119.0	3459.578	-80.3244	28.4895	80.28	35.15	3932.5	83.15	26.46	5081.2	14.988	111076
120.0	3459.953	-80.3145	28.4910	80.29	34.81	4014.8	83.10	26.33	5166.2	15.521	113355
121.0	3460.332	-80.3043	28.4926	80.29	34.46	4098.4	83.06	26.20	5252.5	16.068	115662
122.0	3460.716	-80.2938	28.4941	80.30	34.12	4183.3	83.01	26.07	5340.1	16.628	117996
123.0	3461.104	-80.2831	28.4957	80.30	33.78	4269.5	82.97	25.93	5429.0	17.201	120358
124.0	3461.497	-80.2721	28.4974	80.31	33.45	4357.1	82.92	25.80	5519.2	17.789	122748
125.0	3461.895	-80.2609	28.4991	80.31	33.12	4446.1	82.88	25.66	5610.8	18.391	125165
126.0	3462.297	-80.2494	28.5008	80.31	32.80	4536.5	82.84	25.52	5703.7	19.007	127611
127.0	3462.704	-80.2376	28.5026	80.32	32.49	4628.3	82.80	25.39	5798.0	19.639	130084
128.0	3463.115	-80.2255	28.5044	80.32	32.18	4721.5	82.76	25.25	5893.7	20.285	132586
129.0	3463.532	-80.2132	28.5062	80.33	31.87	4816.3	82.72	25.12	5990.8	20.946	135117
130.0	3463.953	-80.2005	28.5081	80.34	31.57	4912.5	82.69	24.99	6089.4	21.622	137677
131.0	3464.378	-80.1876	28.5101	80.35	31.28	5010.3	82.65	24.86	6189.5	22.314	140266
132.0	3464.809	-80.1744	28.5120	80.35	31.00	5109.5	82.62	24.72	6291.0	23.022	142884
133.0	3465.244	-80.1609	28.5140	80.36	30.71	5210.4	82.59	24.60	6394.1	23.746	145533
134.0	3465.685	-80.1470	28.5161	80.37	30.44	5312.8	82.55	24.47	6498.7	24.487	148211
135.0	3466.130	-80.1329	28.5182	80.37	30.17	5416.9	82.52	24.34	6605.0	25.244	150920
135.960	3466.563	-80.1190	28.5203	80.38	29.91	5518.4	82.49	24.22	6708.5	25.987	153550

S-IC CENTER ENGINE CUTOFF (ENGINE SOLENOID)

TABLE C-III. GEOGRAPHIC POLAR COORDINATES - ASCENT PHASE (CONT.)

TIME SEC	GC DIST NM	LONG DEG E	GC LAT DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL FT/S	HEAD DEG	FLI-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
136.0	3466.581	-80.1184	28.5204	80.38	29.90	5522.7	82.49	24.21	6712.8	26.018	153660
137.0	3467.036	-80.1037	28.5226	80.39	29.64	5613.2	82.47	24.07	6805.5	26.807	156427
138.0	3467.494	-80.0887	28.5248	80.40	29.38	5696.7	82.45	23.93	6891.2	27.611	159211
139.0	3467.955	-80.0734	28.5271	80.41	29.14	5780.7	82.43	23.79	6977.2	28.429	162019
140.0	3468.420	-80.0578	28.5294	80.42	28.90	5865.7	82.41	23.66	7064.2	29.260	164845
141.0	3468.888	-80.0420	28.5317	80.43	28.66	5951.8	82.39	23.52	7152.3	30.105	167690
142.0	3469.359	-80.0260	28.5341	80.44	28.43	6039.2	82.37	23.39	7241.7	30.965	170556
143.0	3469.834	-80.0096	28.5365	80.45	28.20	6128.0	82.35	23.26	7322.4	31.840	173443
144.0	3470.312	-79.9930	28.5390	80.46	27.97	6218.4	82.34	23.13	7404.6	32.728	176350
145.0	3470.794	-79.9761	28.5415	80.47	27.74	6310.0	82.32	23.00	7518.1	33.632	179279
146.0	3471.279	-79.9590	28.5440	80.48	27.52	6403.0	82.30	22.87	7612.9	34.551	182230
147.0	3471.768	-79.9415	28.5466	80.49	27.30	6497.1	82.29	22.74	7708.9	35.485	185201
148.0	3472.260	-79.9237	28.5492	80.50	27.09	6593.0	82.27	22.62	7806.5	36.435	188195
149.0	3472.756	-79.9057	28.5518	80.51	26.88	6690.2	82.26	22.49	7905.5	37.400	191211
150.0	3473.255	-79.8874	28.5545	80.52	26.67	6789.0	82.24	22.37	8005.9	38.381	194250
151.0	3473.759	-79.8687	28.5573	80.53	26.46	6889.1	82.23	22.25	8107.7	39.379	197311
152.0	3474.266	-79.8497	28.5600	80.54	26.26	6990.9	82.21	22.13	8211.1	40.392	200396
153.0	3474.777	-79.8305	28.5629	80.55	26.06	7094.1	82.20	22.01	8316.0	41.423	203504
154.0	3475.292	-79.8109	28.5657	80.56	25.86	7199.0	82.19	21.89	8422.5	42.470	206635
155.0	3475.811	-79.7910	28.5686	80.58	25.67	7305.4	82.18	21.78	8530.5	43.534	209791
156.0	3476.334	-79.7708	28.5716	80.59	25.48	7413.5	82.17	21.66	8640.1	44.616	212971
157.0	3476.861	-79.7502	28.5746	80.60	25.29	7523.2	82.15	21.55	8751.3	45.715	216176
158.0	3477.392	-79.7293	28.5776	80.61	25.11	7634.5	82.14	21.44	8864.1	46.832	219406
159.0	3477.927	-79.7081	28.5807	80.62	24.93	7747.4	82.13	21.33	8978.5	47.967	222662
S-IC OUTBOARD ENGINE CUTOFF (ENGINE SOLENOID)											
159.560	3478.228	-79.6961	28.5824	80.63	24.83	7811.3	82.13	21.27	9053.3	48.610	224495
160.0	3478.466	-79.6866	28.5838	80.64	24.75	7837.4	82.13	21.21	9070.0	49.118	225939
161.0	3479.004	-79.6649	28.5869	80.65	24.57	7830.3	82.14	21.05	9064.6	50.277	229211
S-IC/S-II SEPARATION COMMAND											
161.200	3479.111	-79.6605	28.5876	80.65	24.54	7827.6	82.14	21.02	9062.2	50.509	229862
162.0	3479.537	-79.6432	28.5901	80.67	24.39	7816.7	82.15	20.89	9052.7	51.435	232455
164.0	3480.591	-79.5998	28.5963	80.70	24.03	7793.4	82.18	20.57	9032.9	53.753	238864
166.0	3481.628	-79.5564	28.6025	80.72	23.66	7800.0	82.20	20.25	9042.9	56.073	245173
168.0	3482.652	-79.5128	28.6088	80.75	23.31	7814.7	82.22	19.95	9050.8	58.401	251400
170.0	3483.664	-79.4690	28.6150	80.78	22.96	7839.5	82.24	19.66	9088.6	60.742	257556
172.0	3484.665	-79.4250	28.6213	80.81	22.61	7864.3	82.26	19.37	9116.5	63.096	263644
174.0	3485.654	-79.3806	28.6276	80.85	22.26	7891.8	82.28	19.08	9147.0	65.462	269663
176.0	3486.633	-79.3361	28.6339	80.88	21.92	7919.8	82.29	18.80	9177.8	67.842	275617
178.0	3487.601	-79.2912	28.6402	80.91	21.59	7948.2	82.31	18.51	9209.2	70.236	281505

TABLE C-III. GEOGRAPHIC POLAR COORDINATES - ASCENT PHASE (CONT.)

TIME SEC	GC DIST NM	LONG DEG E	GC LAT DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
180.0	3488.558	-79.2461	28.6465	80.94	21.25	7977.3	82.33	18.24	9241.0	72.643	287328
182.0	3489.505	-79.2008	28.6528	80.97	20.92	8007.0	82.35	17.96	9273.4	75.064	293085
184.0	3490.441	-79.1551	28.6592	81.00	20.60	8037.2	82.37	17.69	9306.2	77.499	298779
186.0	3491.366	-79.1093	28.6656	81.03	20.28	8067.9	82.39	17.42	9339.5	79.947	304409
188.0	3492.281	-79.0631	28.6719	81.07	19.96	8099.2	82.41	17.15	9373.4	82.409	309976
190.0	3493.186	-79.0167	28.6783	81.10	19.64	8131.1	82.43	16.89	9407.7	84.885	315480
192.0	3494.081	-78.9700	28.6847	81.13	19.33	8163.5	82.46	16.63	9442.5	87.376	320922
194.0	3494.965	-78.9230	28.6911	81.16	19.02	8196.5	82.48	16.37	9477.9	89.880	326302
196.0	3495.839	-78.8758	28.6976	81.19	18.72	8230.2	82.50	16.12	9513.8	92.399	331621
198.0	3496.704	-78.8283	28.7040	81.23	18.42	8264.4	82.52	15.87	9550.3	94.931	336880
200.0	3497.558	-78.7805	28.7105	81.26	18.12	8299.3	82.54	15.62	9587.4	97.479	342079
202.0	3498.403	-78.7324	28.7170	81.29	17.83	8334.7	82.56	15.38	9624.9	100.040	347219
204.0	3499.238	-78.6841	28.7234	81.32	17.54	8370.5	82.58	15.13	9662.8	102.617	352300
206.0	3500.064	-78.6354	28.7299	81.36	17.25	8407.0	82.61	14.89	9701.4	105.208	357321
208.0	3500.879	-78.5865	28.7364	81.39	16.95	8444.1	82.63	14.64	9740.5	107.814	362282
210.0	3501.684	-78.5373	28.7430	81.42	16.65	8481.9	82.65	14.39	9780.4	110.435	367180
212.0	3502.479	-78.4878	28.7495	81.46	16.34	8520.4	82.67	14.13	9820.9	113.071	372015
214.0	3503.262	-78.4380	28.7560	81.49	16.04	8559.4	82.70	13.88	9861.9	115.723	376784
216.0	3504.036	-78.3879	28.7626	81.53	15.74	8599.0	82.72	13.63	9903.4	118.391	381490
218.0	3504.798	-78.3375	28.7692	81.56	15.45	8639.0	82.75	13.38	9945.4	121.074	386131
220.0	3505.551	-78.2867	28.7757	81.60	15.16	8679.6	82.77	13.13	9987.8	123.773	390708
222.0	3506.292	-78.2357	28.7823	81.63	14.87	8720.7	82.79	12.89	10030.6	126.488	395223
224.0	3507.024	-78.1844	28.7889	81.67	14.58	8762.3	82.82	12.65	10074.0	129.219	399674
226.0	3507.745	-78.1328	28.7955	81.71	14.30	8804.4	82.84	12.41	10117.8	131.966	404062
228.0	3508.456	-78.0808	28.8022	81.74	14.02	8847.0	82.87	12.18	10162.1	134.729	408387
230.0	3509.156	-78.0285	28.8088	81.78	13.75	8890.2	82.90	11.95	10206.9	137.508	412651
232.0	3509.847	-77.9760	28.8154	81.81	13.48	8933.9	82.92	11.72	10252.1	140.303	416853
234.0	3510.527	-77.9231	28.8221	81.85	13.21	8978.1	82.95	11.49	10297.8	143.115	420993
236.0	3511.197	-77.8699	28.8288	81.88	12.94	9022.9	82.97	11.27	10344.1	145.944	425072
238.0	3511.857	-77.8163	28.8354	81.92	12.68	9068.1	83.00	11.04	10390.8	148.789	429090
240.0	3512.507	-77.7625	28.8421	81.96	12.42	9113.9	83.02	10.82	10437.9	151.651	433048
242.0	3513.148	-77.7083	28.8488	81.99	12.16	9160.2	83.05	10.61	10485.6	154.529	436945
244.0	3513.778	-77.6538	28.8555	82.03	11.91	9206.9	83.07	10.39	10533.7	157.425	440782
246.0	3514.399	-77.5989	28.8622	82.06	11.66	9254.2	83.10	10.18	10582.2	160.338	444560
248.0	3515.010	-77.5438	28.8689	82.10	11.41	9302.0	83.12	9.97	10631.3	163.267	448278
250.0	3515.611	-77.4883	28.8757	82.13	11.17	9350.4	83.15	9.76	10680.8	166.214	451937
252.0	3516.202	-77.4324	28.8824	82.17	10.93	9399.1	83.18	9.56	10730.7	169.178	455537
254.0	3516.784	-77.3763	28.8892	82.21	10.69	9448.4	83.20	9.36	10781.2	172.160	459079
256.0	3517.356	-77.3197	28.8957	82.24	10.46	9498.2	83.23	9.16	10832.0	175.159	462563
258.0	3517.919	-77.2629	28.9027	82.28	10.23	9548.4	83.26	8.96	10883.3	178.176	465989
260.0	3518.472	-77.2057	28.9094	82.32	10.00	9599.1	83.28	8.77	10935.0	181.210	469357
262.0	3519.016	-77.1482	28.9162	82.35	9.77	9650.3	83.31	8.57	10987.3	184.262	472669
264.0	3519.550	-77.0903	28.9230	82.39	9.55	9702.0	83.34	8.38	11040.0	187.332	475923

TABLE C-III. GEOGRAPHIC POLAR COORDINATES - ASCENT PHASE (CONT.)

TIME SEC	GC DIST NM	LONG DEG E	GC LAT DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
266.0	3520.075	-77.0320	28.9298	82.43	9.33	9754.3	83.37	8.20	11093.1	190.421	479121
268.0	3520.591	-76.9735	28.9366	82.47	9.11	9807.0	83.39	8.01	11146.8	193.527	482263
270.0	3521.098	-76.9145	28.9434	82.50	8.90	9860.2	83.42	7.83	11200.8	196.651	485350
272.0	3521.596	-76.8552	28.9502	82.54	8.69	9913.8	83.45	7.65	11255.3	199.794	488381
274.0	3522.084	-76.7956	28.9570	82.58	8.48	9968.0	83.48	7.47	11310.3	202.956	491357
276.0	3522.564	-76.7356	28.9639	82.62	8.28	10022.6	83.51	7.30	11365.7	206.135	494278
278.0	3523.035	-76.6752	28.9707	82.65	8.08	10077.7	83.54	7.12	11421.7	209.334	497145
280.0	3523.496	-76.6145	28.9775	82.69	7.88	10133.4	83.57	6.95	11478.0	212.551	499958
282.0	3523.949	-76.5534	28.9843	82.73	7.69	10189.5	83.59	6.78	11534.9	215.788	502717
284.0	3524.393	-76.4919	28.9912	82.77	7.49	10246.1	83.62	6.62	11592.2	219.043	505422
286.0	3524.829	-76.4301	28.9980	82.81	7.30	10303.2	83.65	6.45	11649.9	222.317	508075
288.0	3525.256	-76.3679	29.0049	82.84	7.12	10360.7	83.68	6.29	11708.2	225.611	510675
290.0	3525.674	-76.3053	29.0117	82.88	6.93	10418.8	83.71	6.13	11766.8	228.924	513223
292.0	3526.083	-76.2423	29.0186	82.92	6.75	10477.3	83.74	5.98	11826.0	232.256	515719
294.0	3526.484	-76.1790	29.0255	82.96	6.57	10536.4	83.77	5.82	11885.6	235.609	518164
296.0	3526.877	-76.1152	29.0323	83.00	6.40	10595.9	83.80	5.67	11945.8	238.980	520557
298.0	3527.261	-76.0511	29.0392	83.04	6.22	10656.0	83.83	5.52	12006.3	242.372	522899
300.0	3527.637	-75.9866	29.0460	83.08	6.05	10716.5	83.86	5.37	12067.4	245.784	525191
302.0	3528.005	-75.9217	29.0529	83.12	5.88	10777.5	83.90	5.23	12128.9	249.216	527433
304.0	3528.365	-75.8565	29.0598	83.16	5.72	10839.0	83.93	5.08	12190.9	252.668	529625
306.0	3528.716	-75.7908	29.0666	83.20	5.56	10901.0	83.96	4.94	12253.3	256.140	531768
308.0	3529.060	-75.7247	29.0735	83.24	5.40	10963.5	83.99	4.80	12316.3	259.633	533862
310.0	3529.395	-75.6582	29.0804	83.28	5.24	11026.5	84.02	4.67	12379.7	263.146	535908
312.0	3529.723	-75.5914	29.0872	83.32	5.09	11089.9	84.05	4.53	12443.6	266.681	537905
314.0	3530.043	-75.5241	29.0941	83.36	4.93	11153.9	84.09	4.40	12508.0	270.236	539855
316.0	3530.354	-75.4564	29.1010	83.40	4.78	11218.4	84.12	4.27	12572.8	273.812	541757
318.0	3530.659	-75.3883	29.1078	83.44	4.64	11283.3	84.15	4.14	12638.2	277.409	543612
320.0	3530.955	-75.3198	29.1147	83.49	4.49	11348.8	84.19	4.01	12704.0	281.028	545421
322.0	3531.244	-75.2508	29.1215	83.53	4.35	11414.8	84.22	3.89	12770.4	284.668	547183
324.0	3531.525	-75.1815	29.1284	83.57	4.21	11481.3	84.25	3.77	12837.2	288.330	548900
326.0	3531.799	-75.1117	29.1352	83.61	4.08	11548.3	84.29	3.65	12904.5	292.013	550571
328.0	3532.066	-75.0415	29.1421	83.65	3.94	11615.8	84.32	3.53	12972.3	295.718	552197
330.0	3532.325	-74.9709	29.1489	83.69	3.81	11683.8	84.36	3.41	13040.6	299.445	553779
332.0	3532.577	-74.8998	29.1557	83.74	3.68	11752.4	84.39	3.30	13109.5	303.195	555317
334.0	3532.821	-74.8284	29.1626	83.78	3.55	11821.4	84.42	3.19	13178.8	306.966	556811
336.0	3533.059	-74.7564	29.1694	83.82	3.43	11891.0	84.46	3.08	13248.6	310.760	558262
338.0	3533.290	-74.6841	29.1762	83.87	3.31	11961.1	84.49	2.97	13318.9	314.577	559670
340.0	3533.513	-74.6113	29.1830	83.91	3.19	12031.7	84.53	2.86	13389.8	318.416	561035
342.0	3533.730	-74.5380	29.1898	83.95	3.07	12102.9	84.57	2.76	13461.2	322.279	562359
344.0	3533.940	-74.4643	29.1966	84.00	2.95	12174.6	84.60	2.66	13533.1	326.164	563641
346.0	3534.143	-74.3902	29.2034	84.04	2.84	12246.8	84.64	2.56	13605.5	330.073	564882
348.0	3534.339	-74.3156	29.2102	84.08	2.73	12319.6	84.67	2.46	13678.5	334.004	566082
350.0	3534.529	-74.2405	29.2169	84.13	2.62	12392.9	84.71	2.36	13752.0	337.960	567242

TABLE C-III. GEOGRAPHIC POLAR COORDINATES - ASCENT PHASE (CONT.)

TIME SEC	GC DIST NM	LONG DEG E	GC LAT DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
352.0	3534.712	-74.1650	29.2237	84.17	2.51	12466.7	84.75	2.27	13826.0	341.939	568363
354.0	3534.889	-74.0890	29.2304	84.22	2.41	12541.1	84.79	2.17	13900.5	345.942	569444
356.0	3535.059	-74.0126	29.2371	84.26	2.31	12616.0	84.82	2.08	13975.6	349.969	570486
358.0	3535.223	-73.9356	29.2439	84.31	2.21	12691.5	84.86	1.99	14051.3	354.020	571490
360.0	3535.381	-73.8583	29.2506	84.35	2.11	12767.6	84.90	1.91	14127.4	358.095	572457
362.0	3535.533	-73.7804	29.2573	84.40	2.02	12844.2	84.94	1.82	14204.2	362.195	573386
364.0	3535.679	-73.7020	29.2639	84.45	1.92	12921.4	84.98	1.74	14281.5	366.320	574278
366.0	3535.818	-73.6232	29.2706	84.49	1.83	12999.1	85.02	1.66	14359.4	370.469	575134
368.0	3535.952	-73.5439	29.2772	84.54	1.74	13077.4	85.06	1.58	14437.8	374.644	575955
370.0	3536.080	-73.4641	29.2839	84.59	1.66	13156.3	85.10	1.50	14516.8	378.844	576739
372.0	3536.203	-73.3838	29.2905	84.63	1.57	13235.8	85.13	1.42	14596.4	383.069	577489
374.0	3536.319	-73.3030	29.2971	84.68	1.49	13315.8	85.17	1.35	14676.5	387.319	578205
376.0	3536.430	-73.2217	29.3036	84.73	1.41	13396.5	85.21	1.28	14757.3	391.596	578886
378.0	3536.536	-73.1399	29.3102	84.77	1.33	13477.7	85.26	1.21	14838.6	395.898	579535
380.0	3536.636	-73.0575	29.3167	84.82	1.25	13559.6	85.30	1.14	14920.6	400.226	580150
382.0	3536.731	-72.9747	29.3232	84.87	1.18	13642.1	85.34	1.07	15003.1	404.581	580733
384.0	3536.820	-72.8914	29.3297	84.92	1.10	13725.2	85.38	1.00	15086.3	408.963	581285
386.0	3536.905	-72.8075	29.3362	84.97	1.03	13808.9	85.42	0.94	15170.1	413.371	581805
388.0	3536.984	-72.7231	29.3426	85.02	0.96	13893.3	85.46	0.88	15254.5	417.805	582294
390.0	3537.059	-72.6382	29.3491	85.07	0.90	13978.2	85.50	0.82	15339.5	422.267	582753
392.0	3537.128	-72.5528	29.3555	85.11	0.83	14063.8	85.55	0.76	15425.2	426.757	583183
394.0	3537.193	-72.4668	29.3618	85.16	0.77	14150.1	85.59	0.70	15511.4	431.274	583583
396.0	3537.253	-72.3803	29.3682	85.21	0.71	14237.0	85.63	0.65	15598.4	435.818	583956
398.0	3537.309	-72.2932	29.3745	85.26	0.65	14324.6	85.67	0.59	15686.0	440.390	584300
400.0	3537.360	-72.2056	29.3808	85.31	0.59	14412.8	85.72	0.54	15774.3	444.991	584617
402.0	3537.407	-72.1174	29.3871	85.36	0.53	14501.7	85.76	0.49	15863.3	449.620	584908
404.0	3537.449	-72.0287	29.3933	85.41	0.48	14591.3	85.81	0.44	15952.8	454.277	585172
406.0	3537.488	-71.9394	29.3995	85.46	0.43	14681.5	85.85	0.39	16043.1	458.963	585411
408.0	3537.522	-71.8496	29.4057	85.51	0.38	14772.4	85.89	0.35	16134.0	463.679	585625
410.0	3537.552	-71.7592	29.4118	85.57	0.33	14864.0	85.94	0.30	16225.7	468.423	585815
412.0	3537.578	-71.6682	29.4179	85.62	0.28	14956.4	85.98	0.26	16318.0	473.197	585982
414.0	3537.601	-71.5767	29.4240	85.67	0.24	15049.5	86.03	0.22	16411.2	478.000	586125
416.0	3537.620	-71.4845	29.4300	85.72	0.20	15143.3	86.07	0.18	16505.0	482.834	586246
418.0	3537.635	-71.3918	29.4360	85.77	0.16	15237.8	86.12	0.14	16599.5	487.697	586345
420.0	3537.647	-71.2985	29.4420	85.83	0.12	15333.0	86.17	0.11	16694.7	492.591	586424
422.0	3537.656	-71.2046	29.4479	85.88	0.08	15429.0	86.21	0.07	16790.7	497.515	586483
424.0	3537.661	-71.1101	29.4538	85.93	0.04	15525.7	86.26	0.04	16887.5	502.471	586522
426.0	3537.663	-71.0149	29.4597	85.99	0.01	15623.3	86.31	0.01	16985.0	507.457	586542
428.0	3537.663	-70.9192	29.4655	86.04	-0.02	15721.6	86.36	-0.02	17083.3	512.475	586544
430.0	3537.659	-70.8229	29.4713	86.09	-0.05	15820.7	86.40	-0.05	17182.4	517.524	586529
432.0	3537.653	-70.7259	29.4770	86.15	-0.08	15920.6	86.45	-0.08	17282.3	522.605	586497
434.0	3537.644	-70.6283	29.4827	86.20	-0.11	16021.2	86.50	-0.10	17382.9	527.719	586449
436.0	3537.633	-70.5301	29.4883	86.26	-0.14	16122.7	86.55	-0.12	17484.4	532.864	586386

TABLE C-III. GEOGRAPHIC POLAR COORDINATES - ASCENT PHASE (CONT.)

TIME SEC	GC DIST NM	LONG DEG E	GC LAT DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
438.0	3537.619	-70.4313	29.4939	86.31	-0.16	16225.0	86.60	-0.15	17586.7	538.043	586309
440.0	3537.603	-70.3318	29.4994	86.37	-0.18	16328.1	86.65	-0.17	17689.8	543.254	586218
442.0	3537.585	-70.2313	29.5049	86.42	-0.20	16432.1	86.70	-0.19	17793.8	548.498	586114
444.0	3537.565	-70.1308	29.5104	86.48	-0.22	16537.0	86.75	-0.20	17898.7	553.776	585999
446.0	3537.543	-70.0294	29.5157	86.54	-0.24	16642.8	86.80	-0.22	18004.4	559.088	585872
448.0	3537.520	-69.9273	29.5211	86.59	-0.25	16749.4	86.85	-0.23	18111.0	564.433	585735
450.0	3537.495	-69.8245	29.5264	86.65	-0.27	16856.9	86.90	-0.25	18218.5	569.813	585588
452.0	3537.468	-69.7211	29.5316	86.71	-0.28	16965.2	86.95	-0.26	18326.9	575.228	585434
454.0	3537.441	-69.6170	29.5368	86.76	-0.29	17074.5	87.00	-0.27	18436.1	580.677	585271
456.0	3537.412	-69.5122	29.5419	86.82	-0.30	17184.7	87.06	-0.27	18546.4	586.162	585102
458.0	3537.382	-69.4067	29.5469	86.88	-0.30	17295.8	87.11	-0.28	18657.5	591.682	584927
S-II CENTER ENGINE CUTOFF (ENGINE SOLENOID)											
459.560	3537.359	-69.3239	29.5508	86.93	-0.31	17383.1	87.15	-0.29	18744.7	596.012	584787
460.0	3537.352	-69.3005	29.5519	86.94	-0.31	17405.6	87.16	-0.29	18767.2	597.238	584748
462.0	3537.320	-69.1937	29.5568	87.00	-0.33	17496.5	87.22	-0.31	18858.1	602.825	584557
464.0	3537.285	-69.0863	29.5617	87.06	-0.35	17587.7	87.27	-0.33	18949.2	608.442	584354
466.0	3537.249	-68.9784	29.5664	87.12	-0.37	17679.3	87.32	-0.34	19040.8	614.088	584136
468.0	3537.210	-68.8698	29.5711	87.18	-0.38	17771.3	87.38	-0.36	19132.8	619.764	583908
470.0	3537.171	-68.7608	29.5758	87.24	-0.39	17863.6	87.43	-0.37	19225.1	625.469	583671
472.0	3537.130	-68.6511	29.5803	87.30	-0.39	17956.0	87.49	-0.37	19317.5	631.204	583429
474.0	3537.090	-68.5408	29.5848	87.36	-0.38	18049.2	87.54	-0.36	19410.7	636.969	583190
476.0	3537.051	-68.4300	29.5892	87.42	-0.37	18141.9	87.60	-0.34	19503.4	642.763	582958
478.0	3537.013	-68.3186	29.5935	87.48	-0.35	18235.1	87.65	-0.32	19596.6	648.587	582735
480.0	3536.978	-68.2066	29.5978	87.54	-0.33	18328.9	87.71	-0.31	19690.4	654.441	582522
482.0	3536.944	-68.0940	29.6019	87.60	-0.31	18423.3	87.76	-0.29	19784.8	660.326	582320
484.0	3536.912	-67.9808	29.6060	87.66	-0.29	18518.3	87.82	-0.27	19879.8	666.241	582130
486.0	3536.881	-67.8671	29.6100	87.72	-0.28	18604.4	87.88	-0.26	19965.9	672.185	581948
488.0	3536.851	-67.7528	29.6139	87.79	-0.28	18689.0	87.94	-0.26	20050.5	678.157	581771
490.0	3536.822	-67.6380	29.6177	87.85	-0.27	18774.0	88.00	-0.25	20135.4	684.156	581596
492.0	3536.793	-67.5226	29.6214	87.91	-0.27	18859.5	88.05	-0.25	20220.9	690.182	581423
494.0	3536.764	-67.4067	29.6250	87.98	-0.26	18946.1	88.11	-0.24	20307.5	696.235	581254
496.0	3536.736	-67.2903	29.6285	88.04	-0.25	19032.7	88.17	-0.24	20394.1	702.316	581087
498.0	3536.709	-67.1734	29.6319	88.11	-0.25	19120.0	88.23	-0.23	20481.4	708.426	580923
500.0	3536.681	-67.0559	29.6353	88.17	-0.25	19208.1	88.29	-0.23	20569.4	714.563	580761
502.0	3536.654	-66.9378	29.6385	88.24	-0.24	19297.0	88.35	-0.23	20658.3	720.728	580601
504.0	3536.628	-66.8192	29.6416	88.30	-0.24	19386.6	88.41	-0.23	20747.9	726.923	580440
506.0	3536.601	-66.7000	29.6446	88.37	-0.24	19476.8	88.48	-0.22	20838.2	733.146	580281
508.0	3536.574	-66.5803	29.6475	88.43	-0.23	19567.7	88.54	-0.22	20929.0	739.398	580123
510.0	3536.548	-66.4600	29.6503	88.50	-0.23	19659.2	88.60	-0.22	21020.5	745.679	579966
512.0	3536.522	-66.3391	29.6530	88.57	-0.23	19751.4	88.66	-0.21	21112.8	751.990	579812
514.0	3536.497	-66.2176	29.6556	88.63	-0.22	19844.3	88.72	-0.21	21205.7	758.331	579661

TABLE C-III. GEOGRAPHIC POLAR COORDINATES - ASCENT PHASE (CONT.)

TIME SEC	GC DIST NM	LONG DEG E	GC LAT DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
516.0	3536.472	-66.0956	29.6580	88.70	-0.21	19937.9	88.78	-0.20	21299.2	764.701	579514
518.0	3536.448	-65.9730	29.6604	88.77	-0.20	20032.0	88.85	-0.19	21393.3	771.102	579372
520.0	3536.425	-65.8498	29.6626	88.84	-0.20	20126.9	88.91	-0.18	21488.2	777.533	579234
522.0	3536.403	-65.7260	29.6647	88.91	-0.19	20222.5	88.97	-0.17	21583.8	783.994	579102
524.0	3536.382	-65.6016	29.6667	88.97	-0.17	20318.8	89.04	-0.16	21680.1	790.486	578977
526.0	3536.363	-65.4766	29.6686	89.04	-0.16	20415.4	89.10	-0.15	21777.1	797.009	578860
528.0	3536.344	-65.3510	29.6704	89.11	-0.15	20513.4	89.17	-0.14	21874.7	803.564	578750
530.0	3536.328	-65.2249	29.6720	89.18	-0.13	20611.8	89.23	-0.13	21973.0	810.150	578651
532.0	3536.313	-65.0981	29.6735	89.25	-0.12	20710.8	89.30	-0.11	22072.1	816.767	578561
534.0	3536.299	-64.9706	29.6749	89.32	-0.10	20810.7	89.36	-0.10	22171.9	823.416	578482
536.0	3536.288	-64.8426	29.6762	89.39	-0.08	20911.2	89.43	-0.08	22272.4	830.098	578416
538.0	3536.279	-64.7139	29.6773	89.46	-0.06	21012.5	89.49	-0.06	22373.7	836.812	578363
540.0	3536.273	-64.5846	29.6783	89.53	-0.04	21114.3	89.56	-0.04	22475.6	843.558	578323
542.0	3536.269	-64.4547	29.6791	89.60	-0.02	21217.3	89.63	-0.02	22578.6	850.337	578299
544.0	3536.267	-64.3242	29.6798	89.67	-0.00	21321.1	89.69	-0.00	22682.3	857.149	578291
546.0	3536.268	-64.1930	29.6804	89.75	0.02	21425.9	89.76	0.02	22787.1	863.995	578300
548.0	3536.273	-64.0611	29.6808	89.82	0.05	21531.8	89.83	0.05	22893.0	870.874	578327
S-II OUTBOARD ENGINE CUTOFF (ENGINE SOLENOID)											
549.060	3536.276	-63.9910	29.6810	89.85	0.06	21588.4	89.86	0.06	22949.6	874.532	578346
550.0	3536.279	-63.9288	29.6811	89.89	0.05	21601.5	89.90	0.05	22962.7	877.780	578365
S-II/S-IVB SEPARATION COMMAND											
550.100	3536.279	-63.9221	29.6811	89.89	0.05	21601.2	89.90	0.05	22962.5	878.126	578366
552.0	3536.283	-63.7962	29.6813	89.96	0.02	21596.4	89.97	0.02	22957.7	884.696	578390
554.0	3536.283	-63.6637	29.6813	90.04	-0.02	21592.8	90.04	-0.02	22954.1	891.612	578392
556.0	3536.280	-63.5311	29.6811	90.11	-0.03	21615.1	90.11	-0.03	22976.3	898.530	578373
558.0	3536.276	-63.3983	29.6808	90.19	-0.05	21647.4	90.17	-0.04	23008.7	905.459	578343
560.0	3536.269	-63.2653	29.6804	90.26	-0.06	21680.3	90.24	-0.06	23041.5	912.397	578304
562.0	3536.261	-63.1321	29.6798	90.33	-0.07	21713.8	90.31	-0.07	23075.1	919.346	578255
564.0	3536.252	-62.9987	29.6790	90.40	-0.08	21747.9	90.38	-0.08	23109.1	926.307	578196
566.0	3536.240	-62.8651	29.6781	90.48	-0.10	21782.3	90.45	-0.09	23143.5	933.278	578126
568.0	3536.227	-62.7313	29.6771	90.55	-0.11	21816.8	90.52	-0.10	23178.1	940.260	578046
570.0	3536.213	-62.5973	29.6759	90.62	-0.12	21851.5	90.59	-0.11	23212.8	947.253	577957
572.0	3536.197	-62.4631	29.6746	90.70	-0.13	21886.5	90.66	-0.13	23247.7	954.258	577858
574.0	3536.179	-62.3287	29.6731	90.77	-0.15	21921.5	90.73	-0.14	23282.7	961.273	577750
576.0	3536.160	-62.1940	29.6714	90.85	-0.16	21956.7	90.80	-0.15	23318.0	968.300	577633
578.0	3536.140	-62.0591	29.6696	90.92	-0.17	21992.1	90.87	-0.16	23353.3	975.339	577506
580.0	3536.118	-61.9241	29.6676	91.00	-0.18	22027.4	90.94	-0.17	23388.6	982.389	577370
582.0	3536.094	-61.7888	29.6655	91.07	-0.19	22062.9	91.01	-0.18	23424.1	989.450	577225
584.0	3536.069	-61.6533	29.6632	91.15	-0.20	22098.5	91.08	-0.19	23459.7	996.522	577071



TABLE C-III. GEOGRAPHIC POLAR COORDINATES - ASCENT PHASE (CONT.)

TIME SEC	GC DIST NM	LONG DEG E	GC LAT DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
586.0	3536.043	-61.5176	29.6608	91.22	-0.21	22134.3	91.15	-0.20	23495.4	1003.606	576909
588.0	3536.015	-61.3816	29.6582	91.30	-0.22	22170.2	91.22	-0.21	23531.4	1010.702	576738
590.0	3535.986	-61.2455	29.6554	91.37	-0.23	22206.3	91.30	-0.22	23567.4	1017.809	576560
592.0	3535.956	-61.1091	29.6525	91.45	-0.24	22242.4	91.37	-0.23	23603.5	1024.928	576374
594.0	3535.925	-60.9726	29.6494	91.53	-0.25	22278.6	91.44	-0.23	23639.7	1032.058	576182
596.0	3535.893	-60.8358	29.6462	91.60	-0.25	22315.0	91.51	-0.24	23676.1	1039.200	575984
598.0	3535.860	-60.6988	29.6428	91.68	-0.26	22351.6	91.58	-0.25	23712.7	1046.354	575779
600.0	3535.826	-60.5616	29.6392	91.75	-0.27	22388.4	91.65	-0.25	23749.4	1053.520	575568
602.0	3535.791	-60.4241	29.6354	91.83	-0.27	22425.2	91.73	-0.26	23786.2	1060.697	575352
604.0	3535.755	-60.2865	29.6315	91.83	-0.28	22462.1	91.80	-0.26	23823.1	1067.887	575130
606.0	3535.719	-60.1486	29.6275	91.98	-0.29	22499.0	91.87	-0.27	23860.0	1075.088	574903
608.0	3535.681	-60.0105	29.6232	92.06	-0.29	22536.1	91.94	-0.27	23897.0	1082.301	574672
610.0	3535.643	-59.8722	29.6188	92.14	-0.30	22573.2	92.02	-0.28	23934.1	1089.526	574436
612.0	3535.605	-59.7337	29.6142	92.21	-0.30	22610.3	92.09	-0.28	23971.3	1096.763	574196
614.0	3535.565	-59.5950	29.6095	92.29	-0.30	22647.6	92.16	-0.29	24008.5	1104.012	573953
616.0	3535.526	-59.4560	29.6046	92.37	-0.31	22685.1	92.23	-0.29	24046.0	1111.273	573707
618.0	3535.486	-59.3169	29.5995	92.45	-0.31	22722.7	92.31	-0.29	24083.6	1118.547	573458
620.0	3535.445	-59.1775	29.5942	92.52	-0.31	22760.5	92.38	-0.29	24121.3	1125.832	573208
622.0	3535.405	-59.0379	29.5888	92.60	-0.31	22798.3	92.45	-0.29	24159.1	1133.130	572955
624.0	3535.364	-58.8981	29.5832	92.68	-0.31	22836.1	92.53	-0.29	24196.9	1140.440	572702
626.0	3535.323	-58.7580	29.5774	92.75	-0.31	22874.0	92.60	-0.29	24234.8	1147.762	572448
628.0	3535.282	-58.6178	29.5715	92.83	-0.31	22912.1	92.67	-0.29	24272.8	1155.096	572193
630.0	3535.241	-58.4773	29.5654	92.91	-0.31	22950.2	92.75	-0.29	24311.0	1162.443	571937
632.0	3535.200	-58.3366	29.5591	92.99	-0.31	22988.4	92.82	-0.29	24349.2	1169.801	571682
634.0	3535.160	-58.1957	29.5526	93.06	-0.31	23026.8	92.89	-0.29	24387.5	1177.173	571427
636.0	3535.119	-58.0546	29.5459	93.14	-0.31	23065.2	92.97	-0.29	24425.9	1184.556	571173
638.0	3535.079	-57.9133	29.5391	93.22	-0.30	23103.7	93.04	-0.29	24464.4	1191.952	570921
640.0	3535.039	-57.7717	29.5321	93.30	-0.30	23142.2	93.11	-0.28	24502.9	1199.361	570671
642.0	3534.999	-57.6299	29.5249	93.37	-0.29	23180.8	93.19	-0.28	24541.5	1206.782	570424
644.0	3534.960	-57.4880	29.5175	93.45	-0.29	23219.6	93.26	-0.27	24580.2	1214.215	570180
646.0	3534.922	-57.3458	29.5100	93.53	-0.28	23258.5	93.33	-0.27	24619.1	1221.661	569939
648.0	3534.884	-57.2033	29.5023	93.61	-0.28	23297.5	93.41	-0.26	24658.1	1229.120	569703
650.0	3534.848	-57.0607	29.4943	93.68	-0.27	23336.7	93.48	-0.26	24697.2	1236.591	569470
652.0	3534.812	-56.9178	29.4863	93.76	-0.27	23375.9	93.56	-0.25	24736.4	1244.074	569243
654.0	3534.776	-56.7748	29.4780	93.84	-0.26	23415.1	93.63	-0.24	24775.7	1251.571	569020
656.0	3534.742	-56.6315	29.4695	93.92	-0.25	23454.5	93.70	-0.24	24815.0	1259.080	568804
658.0	3534.709	-56.4880	29.4609	94.00	-0.24	23494.0	93.78	-0.23	24854.5	1266.602	568593
660.0	3534.677	-56.3442	29.4520	94.08	-0.23	23533.6	93.85	-0.22	24894.0	1274.136	568390
662.0	3534.646	-56.2003	29.4438	94.15	-0.22	23573.3	93.93	-0.21	24933.7	1281.684	568193
664.0	3534.617	-56.0561	29.4354	94.23	-0.21	23613.2	94.00	-0.20	24973.6	1289.244	568004
666.0	3534.589	-55.9118	29.4268	94.31	-0.20	23653.2	94.07	-0.19	25013.7	1296.817	567823
668.0	3534.562	-55.7672	29.4149	94.39	-0.19	23693.5	94.15	-0.18	25053.9	1304.403	567650
670.0	3534.536	-55.6224	29.4051	94.47	-0.18	23733.8	94.22	-0.17	25094.2	1312.002	567486

TABLE C-III. GEOGRAPHIC POLAR COORDINATES - ASCENT PHASE (CONT.)

TIME SEC	GC DIST NM	LONG DEG E	GC LAT DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
672.0	3534.513	-55.4773	29.3951	94.54	-0.17	23774.1	94.30	-0.16	25134.5	1319.614	567330
674.0	3534.490	-55.3321	29.3850	94.62	-0.16	23814.5	94.37	-0.15	25174.9	1327.238	567184
676.0	3534.470	-55.1888	29.3746	94.70	-0.14	23855.0	94.45	-0.14	25215.3	1334.876	567048
678.0	3534.451	-55.0409	29.3641	94.78	-0.13	23895.5	94.52	-0.12	25255.9	1342.527	566923
680.0	3534.434	-54.8950	29.3534	94.86	-0.12	23936.2	94.60	-0.11	25296.5	1350.191	566810
682.0	3534.419	-54.7489	29.3425	94.94	-0.10	23976.9	94.67	-0.09	25337.2	1357.868	566708
684.0	3534.407	-54.6026	29.3314	95.02	-0.08	24017.8	94.75	-0.08	25378.1	1365.559	566619
686.0	3534.396	-54.4560	29.3201	95.10	-0.07	24058.7	94.82	-0.06	25419.0	1373.262	566543
688.0	3534.388	-54.3093	29.3086	95.18	-0.05	24099.6	94.90	-0.05	25459.9	1380.978	566482
690.0	3534.382	-54.1623	29.2969	95.25	-0.03	24140.6	94.97	-0.03	25500.9	1388.708	566435
692.0	3534.379	-54.0151	29.2850	95.33	-0.01	24181.6	95.05	-0.01	25541.9	1396.451	566404
694.0	3534.379	-53.8677	29.2729	95.41	0.01	24222.7	95.12	0.01	25582.9	1404.207	566388
S-IVB 1ST GUIDANCE CUTOFF											
694.670	3534.379	-53.8183	29.2688	95.44	0.01	24236.4	95.15	0.01	25596.7	1406.808	566386
696.0	3534.381	-53.7201	29.2606	95.49	0.02	24242.3	95.20	0.02	25602.5	1411.975	566387
698.0	3534.383	-53.5725	29.2481	95.57	0.02	24242.1	95.28	0.02	25602.4	1419.743	566387
700.0	3534.385	-53.4250	29.2355	95.65	0.02	24242.3	95.35	0.02	25602.5	1427.512	566388
702.0	3534.387	-53.2775	29.2226	95.73	0.02	24242.4	95.43	0.02	25602.6	1435.281	566388
704.0	3534.389	-53.1300	29.2096	95.81	0.02	24242.4	95.51	0.02	25602.6	1443.050	566387
PARKING ORBIT INSERTION											
704.670	3534.390	-53.0807	29.2052	95.84	0.02	24242.4	95.53	0.02	25602.6	1445.652	566387

TABLE C-IV. GEOGRAPHIC POLAR COORDINATES - PARKING ORBIT PHASE

TIME SEC	GC DIST NM	LONG DEG E	GC LAT DEG N	GD LAT DEG N	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	ALTITUDE NM
704.670	3534.390	PARKING ORBIT INSERTION -53.0807	29.2052	29.3650	95.53	0.02	25602.6	93.215
750.0	3534.466	-49.7508	28.8606	29.0192	97.24	0.01	25603.4	93.232
800.0	3534.514	-46.1083	28.3750	28.5320	99.09	0.01	25604.0	93.198
850.0	3534.559	-42.5048	27.7821	27.9369	100.89	0.01	25604.3	93.143
900.0	3534.600	-38.9462	27.0855	27.2377	102.63	0.01	25604.6	93.069
950.0	3534.637	-35.4376	26.2895	26.4386	104.31	0.01	25605.0	92.977
1000.0	3534.670	-31.9825	25.3990	25.5444	105.91	0.01	25605.5	92.869
1050.0	3534.699	-28.5839	24.4187	24.5601	107.43	0.01	25606.0	92.746
1100.0	3534.724	-25.2432	23.3542	23.4908	108.88	0.01	25606.6	92.612
1150.0	3534.744	-21.9611	22.2107	22.3421	110.23	0.00	25607.2	92.467
1200.0	3534.759	-18.7372	20.9937	21.1194	111.50	0.00	25607.9	92.313
1250.0	3534.769	-15.5703	19.7090	19.8282	112.68	0.00	25608.6	92.154
1300.0	3534.775	-12.4585	18.3619	18.4742	113.76	0.00	25609.4	91.991
1350.0	3534.774	-9.3991	16.9579	17.0628	114.76	-0.00	25610.1	91.827
1400.0	3534.769	-6.3891	15.5026	15.5994	115.66	-0.00	25610.9	91.664
1450.0	3534.758	-3.4247	14.0012	14.0894	116.47	-0.00	25611.7	91.503
1500.0	3534.742	-0.5021	12.4589	12.5381	117.19	-0.01	25612.5	91.348
1550.0	3534.720	2.3832	10.8808	10.9505	117.82	-0.01	25613.3	91.199
1600.0	3534.693	5.2357	9.2719	9.3317	118.35	-0.01	25614.1	91.060
1650.0	3534.660	8.0600	7.6371	7.6867	118.80	-0.01	25614.9	90.931
1700.0	3534.623	10.8612	5.9812	6.0202	119.16	-0.01	25615.6	90.815
1750.0	3534.580	13.6442	4.3089	4.3371	119.43	-0.01	25616.3	90.712
1800.0	3534.533	16.4141	2.6249	2.6421	119.61	-0.01	25617.0	90.623
1850.0	3534.482	19.1761	0.9337	0.9398	119.70	-0.01	25617.6	90.551
1900.0	3534.426	21.9354	-0.7601	-0.7651	119.71	-0.02	25618.2	90.494
1950.0	3534.367	24.6971	-2.4519	-2.4680	119.62	-0.02	25618.8	90.454
2000.0	3534.304	27.4664	-4.1372	-4.1643	119.45	-0.02	25619.3	90.424
2050.0	3534.239	30.2485	-5.8113	-5.8492	119.19	-0.02	25619.8	90.434
2100.0	3534.172	33.0485	-7.4696	-7.5181	118.84	-0.02	25620.2	90.459
2150.0	3534.103	35.8714	-9.1074	-9.1661	118.40	-0.02	25620.5	90.500
2200.0	3534.033	38.7222	-10.7198	-10.7885	117.88	-0.02	25620.8	90.555
2250.0	3533.962	41.6055	-12.3020	-12.3803	117.26	-0.02	25621.1	90.623
2300.0	3533.892	44.5261	-13.8491	-13.9365	116.55	-0.02	25621.3	90.702
2350.0	3533.823	47.4881	-15.3558	-15.4518	115.74	-0.02	25621.4	90.792
2400.0	3533.755	50.4957	-16.8169	-16.9211	114.85	-0.02	25621.6	90.890
2450.0	3533.689	53.5526	-18.2272	-18.3389	113.86	-0.02	25621.6	90.995
2500.0	3533.627	56.6619	-19.5812	-19.6999	112.79	-0.02	25621.7	91.106
2550.0	3533.568	59.8262	-20.8734	-20.9985	111.62	-0.02	25621.6	91.220
2600.0	3533.513	63.0476	-22.0981	-22.2291	110.36	-0.01	25621.6	91.335
2650.0	3533.463	66.3274	-23.2499	-23.3861	109.01	-0.01	25621.6	

TABLE C-IV. GEOGRAPHIC POLAR COORDINATES - PARKING ORBIT PHASE (CONT.)

TIME SEC	GC DIST NM	LONG DEG E	GC LAT DEG N	GD LAT DEG N	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	ALTITUDE NM
2700.0	3533.418	69.6660	-24.3231	-24.4641	107.57	-0.01	25621.5	91.451
2750.0	3533.379	73.0628	-25.3124	-25.4576	106.05	-0.01	25621.4	91.565
2800.0	3533.347	76.5164	-26.2123	-26.3612	104.46	-0.01	25621.2	91.675
2850.0	3533.322	80.0241	-27.0179	-27.1699	102.79	-0.01	25621.1	91.780
2900.0	3533.304	83.5821	-27.7243	-27.8790	101.05	-0.00	25621.0	91.879
2950.0	3533.294	87.1857	-28.3273	-28.4841	99.26	-0.00	25620.8	91.970
3000.0	3533.292	90.8289	-28.8229	-28.9814	97.41	0.00	25620.6	92.052
3050.0	3533.299	94.5048	-29.2079	-29.3678	95.52	0.00	25620.5	92.125
3100.0	3533.314	98.2057	-29.4797	-29.6405	93.60	0.01	25620.3	92.187
3150.0	3533.338	101.9231	-29.6364	-29.7978	91.66	0.01	25620.2	92.238
3200.0	3533.370	105.6481	-29.6770	-29.8385	89.70	0.01	25620.0	92.277
3250.0	3533.412	109.3717	-29.6012	-29.7624	87.75	0.01	25619.9	92.305
3300.0	3533.462	113.0848	-29.4094	-29.5700	85.82	0.01	25619.7	92.322
3350.0	3533.520	116.7787	-29.1031	-29.2626	83.91	0.02	25619.6	92.328
3400.0	3533.587	120.4450	-28.6843	-28.8424	82.03	0.02	25619.5	92.323
3450.0	3533.662	124.0763	-28.1559	-28.3121	80.20	0.02	25619.3	92.309
3500.0	3533.745	127.6661	-27.5213	-27.6752	78.42	0.02	25619.2	92.286
3550.0	3533.835	131.2086	-26.7846	-26.9356	76.70	0.03	25619.0	92.255
3600.0	3533.933	134.6993	-25.9502	-26.0979	75.05	0.03	25618.9	92.218
3650.0	3534.036	138.1350	-25.0230	-25.1669	73.48	0.03	25618.7	92.177
3700.0	3534.146	141.5133	-24.0081	-24.1477	71.99	0.03	25618.6	92.131
3750.0	3534.262	144.8330	-22.9110	-23.0457	70.58	0.03	25618.4	92.085
3800.0	3534.382	148.0939	-21.7371	-21.8663	69.26	0.03	25618.2	92.038
3850.0	3534.506	151.2966	-20.4920	-20.6152	68.02	0.03	25618.0	91.993
3900.0	3534.634	154.4428	-19.1812	-19.2978	66.88	0.04	25617.7	91.952
3950.0	3534.765	157.5346	-17.8104	-17.9198	65.83	0.04	25617.4	91.916
4000.0	3534.898	160.5748	-16.3850	-16.4867	64.87	0.04	25617.1	91.887
4050.0	3535.033	163.5667	-14.9104	-15.0039	64.01	0.04	25616.7	91.867
4100.0	3535.169	166.5143	-13.3919	-13.4766	63.23	0.04	25616.3	91.857
4150.0	3535.305	169.4216	-11.8348	-11.9102	62.55	0.04	25615.9	91.859
4200.0	3535.441	172.2929	-10.2440	-10.3098	61.96	0.04	25615.4	91.874
4250.0	3535.577	175.1330	-8.6245	-8.6802	61.46	0.04	25614.9	91.904
4300.0	3535.711	177.9467	-6.9812	-7.0266	61.04	0.04	25614.3	91.948
4350.0	3535.843	-179.2611	-5.3189	-5.3536	60.72	0.04	25613.7	92.008
4400.0	3535.972	-176.4854	-3.6422	-3.6660	60.49	0.03	25613.0	92.085
4450.0	3536.099	-173.7210	-1.9557	-1.9685	60.34	0.03	25612.3	92.178
4500.0	3536.222	-170.9627	-0.2641	-0.2658	60.28	0.03	25611.5	92.288
4550.0	3536.342	-168.2055	1.4281	1.4375	60.32	0.03	25610.7	92.415
4600.0	3536.457	-165.4441	3.1163	3.1367	60.43	0.03	25609.8	92.558
4650.0	3536.569	-162.6734	4.7961	4.8274	60.64	0.03	25608.9	92.716
4700.0	3536.676	-159.8882	6.4627	6.5047	60.93	0.03	25608.0	92.888
4750.0	3536.778	-157.0835	8.1115	8.1640	61.32	0.03	25607.1	93.075
4800.0	3536.875	-154.2543	9.7379	9.8005	61.79	0.03	25606.1	93.273

TABLE C-IV. GEOGRAPHIC POLAR COORDINATES - PARKING ORBIT PHASE (CONT.)

TIME SEC	GC DIST NM	LONG DEG E	GC LAT DEG N	GD LAT DEG N	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	ALTITUDE NM
4850.0	3536.967	-151.3958	11.3369	11.4093	62.35	0.02	25605.1	93.481
4900.0	3537.054	-148.5032	12.9038	12.9855	63.01	0.02	25604.1	93.699
4950.0	3537.137	-145.5722	14.4234	14.5241	63.75	0.02	25603.1	93.923
5000.0	3537.214	-142.5984	15.9207	16.0198	64.59	0.02	25602.1	94.152
5050.0	3537.286	-139.5781	17.3606	17.4675	65.51	0.02	25601.1	94.384
5100.0	3537.353	-136.5078	18.7475	18.8618	66.53	0.02	25600.1	94.617
5150.0	3537.415	-133.3844	20.0762	20.1972	67.65	0.02	25599.1	94.848
5200.0	3537.473	-130.2055	21.3411	21.4683	68.85	0.02	25598.2	95.075
5250.0	3537.526	-126.9694	22.5367	22.6696	70.14	0.01	25597.3	95.296
5300.0	3537.575	-123.6752	23.6575	23.7954	71.52	0.01	25596.5	95.508
5350.0	3537.620	-120.3227	24.6980	24.8405	72.98	0.01	25595.7	95.710
5400.0	3537.661	-116.9128	25.6529	25.7993	74.52	0.01	25595.0	95.899
5450.0	3537.697	-113.4474	26.5170	26.6668	76.14	0.01	25594.3	96.074
5500.0	3537.730	-109.9295	27.2852	27.4380	77.83	0.01	25593.7	96.232
5550.0	3537.760	-106.3632	27.9532	28.1085	79.59	0.01	25593.2	96.372
5600.0	3537.786	-102.7537	28.5167	28.6740	81.40	0.01	25592.7	96.493
5650.0	3537.809	-99.1071	28.9722	29.1311	83.26	0.01	25592.4	96.594
5700.0	3537.828	-95.4307	29.3166	29.4766	85.16	0.00	25592.1	96.673
5750.0	3537.845	-91.7324	29.5475	29.7084	87.08	0.00	25591.9	96.729
5800.0	3537.858	-88.0207	29.6635	29.8247	89.02	0.00	25591.8	96.763
5850.0	3537.869	-84.3045	29.6637	29.8249	90.97	0.00	25591.8	96.774
5900.0	3537.877	-80.5927	29.5481	29.7089	92.91	0.00	25591.9	96.761
5950.0	3537.882	-76.8944	29.3175	29.4775	94.84	0.00	25592.1	96.726
6000.0	3537.884	-73.2180	28.9735	29.1323	96.74	0.00	25592.3	96.669
6050.0	3537.883	-69.5715	28.5184	28.6757	98.59	-0.00	25592.7	96.591
6100.0	3537.879	-65.9619	27.9552	28.1105	100.41	-0.00	25593.1	96.492
6150.0	3537.872	-62.3956	27.2876	27.4404	102.16	-0.00	25593.6	96.374
6200.0	3537.862	-58.8777	26.5197	26.6695	103.85	-0.00	25594.2	96.239
6250.0	3537.848	-55.4124	25.6560	25.8024	105.47	-0.00	25594.8	96.087
6300.0	3537.832	-52.0025	24.7015	24.8439	107.02	-0.00	25595.5	95.922
6350.0	3537.812	-48.6501	23.6613	23.7992	108.48	-0.01	25596.3	95.745
6400.0	3537.788	-45.3559	22.5409	22.6737	109.86	-0.01	25597.1	95.558
6450.0	3537.761	-42.1199	21.3456	21.4729	111.15	-0.01	25598.0	95.363
6500.0	3537.729	-38.9411	20.0811	20.2021	112.35	-0.01	25598.8	95.162
6550.0	3537.694	-35.8179	18.7528	18.8671	113.46	-0.01	25599.7	94.959
6600.0	3537.656	-32.7477	17.3662	17.4732	114.48	-0.01	25600.7	94.755
6650.0	3537.613	-29.7276	15.9268	16.0259	115.41	-0.01	25601.6	94.552
6700.0	3537.566	-26.7541	14.4398	14.5305	116.25	-0.01	25602.5	94.353
6750.0	3537.515	-23.8233	12.9106	12.9924	116.99	-0.01	25603.5	94.160
6800.0	3537.459	-20.9311	11.3441	11.4166	117.64	-0.02	25604.4	93.974
6850.0	3537.400	-18.0730	9.7455	9.8082	118.21	-0.02	25605.3	93.799
6900.0	3537.337	-15.2442	8.1196	8.1721	118.68	-0.02	25606.2	93.635
6950.0	3537.271	-12.4400	6.4712	6.5133	119.06	-0.02	25607.0	93.484

TABLE C-IV. GEOGRAPHIC POLAR COORDINATES - PARKING ORBIT PHASE (CONT.)

TIME SEC	GC DIST NM	LONG DEG E	GC LAT DEG N	GD LAT DEG N	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	ALTITUDE NM
7000.0	3537.200	-9.6554	4.8050	4.8364	119.36	-0.02	25607.8	93.347
7050.0	3537.126	-6.8852	3.1257	3.1462	119.57	-0.02	25608.6	93.227
7100.0	3537.049	-4.1245	1.4379	1.4473	119.68	-0.02	25609.3	93.123
7150.0	3536.970	-1.3681	-0.2538	-0.2555	119.72	-0.02	25610.0	93.036
7200.0	3536.887	1.3893	-1.9450	-1.9578	119.66	-0.02	25610.6	92.967
7250.0	3536.803	4.1528	-3.6310	-3.6548	119.51	-0.02	25611.2	92.915
7300.0	3536.717	6.9275	-5.3073	-5.3419	119.28	-0.02	25611.7	92.882
7350.0	3536.629	9.7186	-6.9692	-7.0145	118.96	-0.02	25612.2	92.866
7400.0	3536.541	12.5310	-8.6121	-8.6677	118.55	-0.02	25612.6	92.867
7450.0	3536.453	15.3698	-10.2311	-10.2968	118.05	-0.02	25613.0	92.885
7500.0	3536.365	18.2396	-11.8216	-11.8969	117.46	-0.02	25613.3	92.918
7550.0	3536.278	21.1453	-13.3784	-13.4630	116.77	-0.02	25613.6	92.965
7600.0	3536.192	24.0911	-14.8966	-14.9900	116.00	-0.02	25613.8	93.025
7650.0	3536.109	27.0812	-16.3710	-16.4726	115.14	-0.02	25613.9	93.096
7700.0	3536.029	30.1193	-17.7962	-17.9055	114.18	-0.02	25614.0	93.178
7750.0	3535.952	33.2089	-19.1669	-19.2834	113.13	-0.02	25614.1	93.268
7800.0	3535.879	36.3527	-20.4777	-20.6008	111.99	-0.02	25614.1	93.364
7850.0	3535.810	39.5529	-21.7229	-21.8520	110.76	-0.02	25614.1	93.465
7900.0	3535.747	42.8111	-22.8970	-23.0316	109.44	-0.02	25614.1	93.569
7950.0	3535.690	46.1279	-23.9945	-24.1340	108.03	-0.01	25614.1	93.674
8000.0	3535.640	49.5032	-25.0099	-25.1537	106.54	-0.01	25614.0	93.778
8050.0	3535.596	52.9357	-26.7729	-26.9239	104.97	-0.01	25613.9	93.880
8100.0	3535.532	56.4232	-28.1465	-28.3025	103.33	-0.01	25613.5	94.071
8150.0	3535.501	60.1763	-29.0967	-29.2561	99.83	-0.00	25613.4	94.157
8200.0	3535.512	63.5485	-29.6763	-29.8342	98.00	-0.00	25613.4	94.236
8250.0	3535.499	67.1763	-29.4048	-29.5653	96.13	-0.00	25613.2	94.305
8300.0	3535.506	70.8390	-29.5986	-29.7597	94.22	0.00	25613.1	94.365
8350.0	3535.522	74.5292	-29.6767	-29.8381	92.28	0.01	25612.9	94.415
8400.0	3535.547	78.2387	-29.6386	-29.7999	90.34	0.01	25612.8	94.454
8450.0	3535.582	81.9587	-29.4845	-29.6453	88.39	0.01	25612.6	94.483
8500.0	3535.627	85.6802	-29.2156	-29.3754	86.45	0.01	25612.4	94.500
8550.0	3535.680	89.3941	-28.8336	-28.9921	84.53	0.02	25612.3	94.507
8600.0	3535.742	93.0917	-28.3413	-28.4980	82.64	0.02	25612.1	94.504
8650.0	3535.813	96.7643	-27.7417	-27.8963	80.79	0.02	25611.9	94.491
8700.0	3535.893	100.4044	-27.0388	-27.1907	77.26	0.02	25611.8	94.470
8750.0	3535.980	104.0050	-26.2369	-26.3857	75.59	0.03	25611.6	94.441
8800.0	3536.074	107.5602	-25.3407	-25.4858	73.99	0.03	25611.4	94.406
8850.0	3536.176	111.0651	-24.3552	-24.4962	72.47	0.03	25610.9	94.365
8900.0	3536.283	114.5160	-23.2859	-23.4222	71.04	0.03	25610.6	94.321
8950.0	3536.396	117.9103	-22.1381	-22.2691	69.69	0.03	25610.3	94.274
9000.0	3536.514	121.2463	-20.9173	-21.0425	68.43	0.03	25610.0	94.227
9050.0	3536.636	124.5236						
9100.0		127.7425						

TABLE C-IV. GEOGRAPHIC POLAR COORDINATES - PARKING ORBIT PHASE (CONT.)

TIME SEC	GC DIST NM	LONG DEG E	GC LAT DEG N	GD LAT DEG N	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	ALTITUDE NM
9150.0	3536.761	130.9044	-19.6292	-19.7480	67.26	0.03	25609.7	94.135
9200.0	3536.888	134.0111	-18.2792	-18.3911	66.17	0.03	25609.3	94.094
9250.0	3537.016	137.0653	-16.8730	-16.9773	65.19	0.04	25608.9	94.059
9300.0	3537.145	140.0702	-15.4158	-15.5121	64.29	0.04	25608.5	94.031
9350.0	3537.274	143.0294	-13.9131	-14.0007	63.49	0.03	25608.1	94.010
9400.0	3537.401	145.9470	-12.3699	-12.4486	62.77	0.03	25607.6	93.999
9450.0	3537.526	148.8272	-10.7915	-10.8606	62.15	0.03	25607.1	93.998
9500.0	3537.647	151.6746	-9.1828	-9.2420	61.62	0.03	25606.5	94.009
9550.0	3537.765	154.4940	-7.5487	-7.5976	61.18	0.03	25606.0	94.031
9600.0	3537.877	157.2903	-5.8939	-5.9323	60.82	0.03	25605.4	94.065
BEGIN S-IVB RESTART PREPARATIONS -- START OF TIME BASE 6								
9624.800	3537.918	158.6702	-5.0669	-5.1000	60.68	0.03	25605.0	94.074

TABLE C-V. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS - SECOND BURN AND TRANSILUNAR PHASES

TIME SEC	XE FT	YE FT	ZE FT	OXE FT/S	DYE FT/S	DZE FT/S	DDXE FT/S SQ	DDYE FT/S SQ	DDZE FT/S SQ
9624.800	-31423483	-6744928	-17507215	21146.8	-4642.6	-10936.0	13.39	8.21	22.42
BEGIN S-IVB RESTART PREPARATIONS -- START OF TIME BASE 6									
9630.0	-31313377	-6768983	-17563843	21216.2	-4599.8	-10819.2	13.25	8.25	22.49
9640.0	-31100557	-6814567	-17670908	21347.3	-4517.0	-10593.6	12.98	8.33	22.62
9650.0	-30886440	-6859319	-17775711	21475.8	-4433.3	-10366.8	12.71	8.40	22.75
9660.0	-30671051	-6903231	-17878240	21601.5	-4348.9	-10138.7	12.43	8.48	22.87
9670.0	-30454419	-6946294	-17978481	21724.5	-4263.7	-9909.4	12.16	8.56	22.99
9680.0	-30236571	-6988502	-18076423	21844.6	-4177.8	-9678.9	11.88	8.63	23.11
9690.0	-30017535	-7029847	-18172055	21962.1	-4091.1	-9447.3	11.60	8.70	23.22
9700.0	-29797339	-7070321	-18265365	22076.7	-4003.7	-9214.5	11.32	8.77	23.33
9710.0	-29576011	-7109918	-18356341	22188.5	-3915.6	-8980.6	11.04	8.85	23.44
9720.0	-29353580	-7148631	-18444974	22297.4	-3826.8	-8745.7	10.75	8.92	23.54
9730.0	-29130072	-7186452	-18531252	22403.5	-3737.3	-8509.8	10.47	8.98	23.65
9740.0	-28905518	-7223374	-18615165	22506.8	-3647.1	-8272.8	10.18	9.05	23.74
9750.0	-28679946	-7259392	-18696705	22607.2	-3556.3	-8034.9	9.90	9.12	23.84
9760.0	-28453384	-7294497	-18775860	22704.7	-3464.8	-7796.0	9.61	9.18	23.93
9770.0	-28225862	-7328685	-18852622	22799.3	-3372.6	-7556.2	9.32	9.25	24.02
9780.0	-27997408	-7361948	-18926981	22891.0	-3279.8	-7315.6	9.03	9.31	24.11
9790.0	-27768051	-7394280	-18998930	22979.8	-3186.4	-7074.1	8.73	9.37	24.19
9800.0	-27537821	-7425675	-19068460	23065.7	-3092.4	-6831.7	8.44	9.43	24.27
9810.0	-27306748	-7456126	-19135562	23148.6	-2997.8	-6588.6	8.14	9.49	24.35
9820.0	-27074859	-7485629	-19200230	23228.6	-2902.6	-6344.8	7.85	9.55	24.42
9830.0	-26842186	-7514177	-19262455	23305.6	-2806.9	-6100.2	7.55	9.60	24.49
9840.0	-26608758	-7541765	-19322231	23379.6	-2710.6	-5854.9	7.26	9.66	24.56
9850.0	-26374604	-7568387	-19379551	23450.7	-2613.7	-5608.9	6.96	9.71	24.63
9860.0	-26139754	-7594037	-19434408	23518.7	-2516.3	-5362.4	6.66	9.77	24.69
9870.0	-25904239	-7618711	-19486796	23583.8	-2418.4	-5115.2	6.36	9.82	24.75
9880.0	-25668088	-7642402	-19536709	23645.9	-2319.9	-4867.4	6.06	9.87	24.80
9890.0	-25431331	-7665107	-19584143	23704.9	-2221.0	-4619.2	5.75	9.92	24.85
9900.0	-25193999	-7686820	-19629091	23761.0	-2121.6	-4370.4	5.45	9.97	24.90
9910.0	-24956122	-7707537	-19671549	23814.0	-2021.7	-4121.1	5.15	10.01	24.95
9920.0	-24717729	-7727253	-19711512	23863.9	-1921.3	-3871.4	4.84	10.06	24.99
9930.0	-24478853	-7745963	-19748976	23910.9	-1820.6	-3621.3	4.54	10.10	25.03
9940.0	-24239522	-7763663	-19783937	23954.7	-1719.3	-3370.8	4.24	10.14	25.07
9950.0	-23999768	-7780348	-19816392	23995.6	-1617.7	-3120.0	3.93	10.18	25.10
9960.0	-23759621	-7796015	-19846336	24033.3	-1515.7	-2868.9	3.62	10.22	25.13
9970.0	-23519111	-7810660	-19873768	24068.0	-1413.3	-2617.5	3.32	10.26	25.15
9980.0	-23278270	-7824279	-19898885	24099.7	-1310.5	-2365.8	3.01	10.30	25.18
9990.0	-23037128	-7836868	-19921083	24128.2	-1207.3	-2113.9	2.70	10.34	25.20
10000.0	-22795716	-7848424	-19940962	24153.7	-1103.8	-1861.9	2.39	10.37	25.21
10010.0	-22555408	-7858976	-19956960	24176.1	-1003.8	-1621.4	2.09	10.40	25.23



TABLE C-V. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS - SECOND BURN AND TRANSUNAR PHASES (CONT.)

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S	DDXE FT/S SQ	DDYE FT/S SQ	DDZE FT/S SQ
10020.0	-22313548	-7868494	-19971912	24195.4	-899.7	-1369.0	1.78	10.43	25.24
10030.0	-22071510	-7876968	-19984340	24211.6	-795.2	-1116.6	1.47	10.46	25.25
10040.0	-21829326	-7884396	-19994243	24224.8	-690.4	-864.1	1.16	10.49	25.25
10050.0	-21587075	-7890775	-20001621	24234.8	-585.4	-611.5	0.85	10.52	25.25
10060.0	-21344640	-7896103	-20006474	24241.8	-480.0	-359.0	0.56	10.55	25.27
10070.0	-21102199	-7900375	-20008801	24245.8	-374.4	-106.4	0.23	10.57	25.24
10080.0	-20859734	-7903591	-20008604	24246.7	-268.7	145.9	-0.06	10.59	25.22
10090.0	-20617277	-7905748	-20005884	24244.4	-162.7	398.1	-0.38	10.61	25.22
10100.0	-20374857	-7906844	-20000641	24239.0	-56.5	650.3	-0.69	10.63	25.21
10110.0	-20132507	-7906876	-19992878	24230.5	50.0	902.3	-1.00	10.65	25.19
10120.0	-19890257	-7905844	-19982597	24218.9	156.5	1154.0	-1.31	10.67	25.17
10130.0	-19648138	-7903745	-19969798	24204.5	263.3	1405.6	-1.60	10.68	25.14
10140.0	-19406179	-7900578	-19954486	24186.8	370.2	1656.9	-1.91	10.70	25.13
10150.0	-19164411	-7896340	-19936661	24166.2	477.2	1907.9	-2.23	10.71	25.08
10160.0	-18922865	-7891032	-19916328	24142.4	584.4	2158.7	-2.53	10.72	25.05
10170.0	-18681572	-7884652	-19893491	24115.6	691.6	2408.8	-2.84	10.73	25.02
10180.0	-18440563	-7877199	-19868151	24085.7	799.0	2658.8	-3.13	10.73	24.95
10190.0	-18199868	-7868672	-19840316	24052.8	906.4	2908.3	-3.45	10.75	24.95
10200.0	-17959518	-7859070	-19809987	24016.8	1013.8	3157.2	-3.73	10.73	24.85
10202.900	-17889884	-7856084	-19800726	24005.8	1044.9	3229.2	-3.81	10.72	24.83
10204.0	-17863479	-7854928	-19797158	24005.1	1057.2	3257.5	2.63	11.54	26.62
10206.0	-17815455	-7852792	-19790592	24026.3	1080.3	3311.0	13.76	11.59	26.82
10208.0	-17767370	-7850609	-19783917	24054.4	1103.5	3364.8	14.21	11.63	26.93
10210.0	-17719238	-7848379	-19777134	24082.8	1126.8	3418.8	14.20	11.67	27.10
10212.0	-17671046	-7846101	-19770242	24111.2	1150.2	3473.1	14.19	11.72	27.26
10214.0	-17622797	-7843777	-19763240	24139.5	1173.8	3527.9	14.18	11.83	27.57
10216.0	-17574491	-7841406	-19756128	24167.8	1197.7	3583.7	14.16	12.12	28.23
10218.0	-17526128	-7838986	-19748903	24196.1	1222.2	3640.8	14.15	12.38	28.86
10220.0	-17477708	-7836516	-19741563	24224.4	1247.2	3698.9	14.14	12.48	29.11
10222.0	-17429231	-7833997	-19734107	24252.5	1272.1	3757.2	14.17	12.45	29.01
10224.0	-17380698	-7831428	-19726535	24280.8	1297.0	3815.1	14.17	12.45	28.90
10226.0	-17332108	-7828809	-19718847	24309.1	1322.0	3873.0	14.14	12.52	28.94
10228.0	-17283462	-7826139	-19711043	24337.4	1347.1	3930.9	14.13	12.61	29.04
10230.0	-17234759	-7823420	-19703123	24365.6	1372.4	3989.1	14.12	12.68	29.08
10232.0	-17185999	-7820650	-19695087	24393.9	1397.8	4047.2	14.13	12.70	29.06
10234.0	-17137183	-7817829	-19686934	24422.1	1423.2	4105.3	14.12	12.71	29.03
10236.0	-17088311	-7814957	-19678566	24450.3	1448.7	4163.3	14.11	12.73	29.02
10238.0	-17039382	-7812034	-19670281	24478.5	1474.2	4221.4	14.08	12.78	29.07
10240.0	-16990397	-7809060	-19661780	24506.6	1499.8	4279.6	14.04	12.83	29.14
10242.0	-16941355	-7806035	-19653162	24534.7	1525.5	4338.0	14.03	12.85	29.20

S-IVB RE-IGNITION (STDV OPEN)

TABLE C-V. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS - SECOND BURN AND TRANSUNAR PHASES (CONT.)

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S	DDXE FT/S SQ	DDYE FT/S SQ	DDZE FT/S SQ
10244.0	-16892258	-7802958	-19644428	24562.8	1551.2	4396.4	14.04	12.88	29.23
10246.0	-16843104	-7799830	-19635577	24590.8	1577.0	4454.9	14.04	12.92	29.23
10248.0	-16793895	-7796608	-19626608	24618.9	1602.9	4513.3	14.01	12.95	29.22
10250.0	-16744629	-7793418	-19617523	24646.9	1628.8	4571.8	13.99	12.98	29.23
10252.0	-16695307	-7790135	-19608321	24674.8	1654.8	4630.2	13.98	13.01	29.23
10254.0	-16645929	-7786799	-19599002	24702.7	1680.8	4688.7	13.96	13.03	29.23
10256.0	-16596496	-7783411	-19589566	24730.6	1706.9	4747.1	13.95	13.06	29.24
10258.0	-16547006	-7779971	-19580013	24758.5	1733.1	4805.6	13.93	13.09	29.24
10260.0	-16497460	-7776479	-19570342	24787.0	1759.3	4864.5	16.13	13.37	30.03
10262.0	-16447851	-7772934	-19560552	24820.1	1786.1	4924.6	16.62	13.40	30.06
10264.0	-16398178	-7769335	-19550643	24853.3	1812.9	4984.7	16.63	13.43	30.09
10266.0	-16348438	-7765682	-19540612	24886.6	1839.8	5045.0	16.65	13.46	30.12
10268.0	-16298631	-7761975	-19530462	24919.9	1866.8	5105.2	16.67	13.49	30.15
10270.0	-16248758	-7758215	-19520190	24953.2	1893.8	5165.6	16.68	13.52	30.19
10272.0	-16198818	-7754401	-19509798	24986.6	1920.8	5226.2	16.70	13.56	30.22
10274.0	-16148811	-7750532	-19499286	25020.1	1947.9	5286.7	16.72	13.58	30.25
10276.0	-16098738	-7746609	-19488652	25053.5	1975.1	5347.2	16.73	13.58	30.28
10278.0	-16048597	-7742632	-19477897	25087.0	2002.2	5407.8	16.73	13.59	30.29
10280.0	-15998390	-7738600	-19467021	25120.4	2029.5	5468.3	16.72	13.61	30.29
10282.0	-15948116	-7734514	-19456023	25153.8	2056.7	5528.9	16.72	13.66	30.30
10284.0	-15897775	-7730373	-19444905	25187.3	2084.1	5589.6	16.74	13.69	30.32
10286.0	-15847366	-7726177	-19433665	25220.8	2111.5	5650.2	16.77	13.71	30.35
10288.0	-15796891	-7721927	-19422304	25254.4	2138.9	5711.0	16.79	13.73	30.37
10290.0	-15746349	-7717622	-19410821	25287.9	2166.4	5771.7	16.78	13.75	30.40
10292.0	-15695739	-7713261	-19399217	25321.5	2193.9	5832.5	16.78	13.76	30.40
10294.0	-15645063	-7708846	-19387491	25355.1	2221.4	5893.3	16.80	13.76	30.38
10296.0	-15594319	-7704376	-19375644	25388.7	2248.9	5954.1	16.83	13.75	30.35
10298.0	-15543508	-7699850	-19363675	25422.4	2276.4	6014.8	16.86	13.76	30.34
10300.0	-15492630	-7695270	-19351585	25456.1	2304.0	6075.4	16.86	13.79	30.35
10302.0	-15441684	-7690634	-19339373	25489.8	2331.6	6136.2	16.85	13.82	30.38
10304.0	-15390670	-7685943	-19327040	25523.5	2359.3	6197.0	16.86	13.85	30.43
10306.0	-15339589	-7681197	-19314585	25557.3	2387.0	6257.9	16.88	13.86	30.49
10308.0	-15288441	-7676396	-19302008	25591.0	2414.7	6318.9	16.89	13.87	30.52
10310.0	-15237225	-7671538	-19289310	25624.8	2442.5	6380.0	16.90	13.90	30.54
10312.0	-15185942	-7666626	-19276489	25658.6	2470.3	6441.1	16.91	13.94	30.57
10314.0	-15134591	-7661657	-19263545	25692.5	2498.2	6502.2	16.93	13.95	30.60
10316.0	-15083172	-7656633	-19250480	25726.4	2526.1	6563.5	16.95	13.95	30.63
10318.0	-15031685	-7651553	-19237291	25760.3	2554.0	6624.7	16.96	13.96	30.65
10320.0	-14980131	-7646417	-19223981	25794.2	2581.9	6686.1	16.98	13.99	30.68
10322.0	-14928508	-7641225	-19210547	25828.2	2609.9	6747.4	17.01	14.02	30.69
10324.0	-14876818	-7635977	-19196991	25862.2	2638.0	6808.8	17.04	14.05	30.70
10326.0	-14825059	-7630673	-19183312	25896.3	2666.2	6870.3	17.06	14.08	30.73
10328.0	-14773232	-7625312	-19169510	25930.5	2694.3	6931.8	17.07	14.09	30.77

TABLE C-V. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS - SECOND BURN AND TRANSLUNAR PHASES (CONT.)

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S	DDXE FT/S SQ	DDYE FT/S SQ	DDZE FT/S SQ
10330.0	-14721337	-7619896	-19155585	25964.6	2722.5	6993.3	17.10	14.11	30.81
10332.0	-14669374	-7614422	-19141536	25998.8	2750.8	7055.0	17.11	14.14	30.84
10334.0	-14617342	-7608892	-19127365	26033.1	2779.1	7116.7	17.11	14.17	30.86
10336.0	-14565242	-7603306	-19113070	26067.3	2807.4	7178.4	17.13	14.18	30.87
10338.0	-14513073	-7597663	-19098651	26101.6	2835.8	7240.2	17.16	14.19	30.90
10340.0	-14460835	-7591963	-19084109	26135.9	2864.2	7302.0	17.18	14.23	30.94
10342.0	-14408529	-7586206	-19069443	26170.3	2892.7	7363.9	17.21	14.26	30.98
10344.0	-14356154	-7580392	-19054653	26204.8	2921.2	7425.9	17.24	14.27	31.00
10346.0	-14303710	-7574521	-19039740	26239.3	2949.8	7487.9	17.26	14.27	31.01
10348.0	-14251197	-7568593	-19024702	26273.8	2978.3	7550.0	17.28	14.29	31.05
10350.0	-14198614	-7562608	-19009540	26308.4	3006.9	7612.1	17.30	14.33	31.08
10352.0	-14145963	-7556565	-18994253	26343.0	3035.6	7674.3	17.34	14.35	31.09
10354.0	-14093242	-7550465	-18978843	26377.7	3064.3	7736.5	17.37	14.37	31.11
10356.0	-14040452	-7544308	-18963307	26412.5	3093.1	7798.7	17.40	14.40	31.15
10358.0	-13987592	-7538093	-18947648	26447.3	3121.9	7861.1	17.42	14.43	31.20
10360.0	-13934663	-7531820	-18931863	26482.2	3150.8	7923.5	17.44	14.45	31.23
10362.0	-13881663	-7525489	-18915954	26517.1	3179.7	7986.0	17.47	14.48	31.24
10364.0	-13828594	-7519101	-18899919	26552.1	3208.7	8048.5	17.51	14.48	31.26
10366.0	-13775455	-7512655	-18883760	26587.1	3237.7	8111.0	17.55	14.49	31.28
10368.0	-13722246	-7506150	-18867475	26622.3	3266.7	8173.6	17.59	14.51	31.32
10370.0	-13668966	-7499588	-18851065	26657.5	3295.7	8236.3	17.63	14.56	31.35
10372.0	-13615615	-7492967	-18834530	26692.8	3324.9	8299.0	17.68	14.59	31.38
10374.0	-13562194	-7486288	-18817869	26728.2	3354.1	8361.8	17.70	14.62	31.40
10376.0	-13508703	-7479551	-18801082	26763.6	3383.4	8424.7	17.71	14.63	31.44
10378.0	-13455140	-7472755	-18784170	26799.1	3412.6	8487.6	17.73	14.64	31.47
10380.0	-13401506	-7465900	-18767132	26834.6	3441.9	8550.5	17.79	14.65	31.48
10382.0	-13347801	-7458987	-18749968	26870.2	3471.2	8613.5	17.84	14.67	31.50
10384.0	-13294025	-7452015	-18732678	26906.0	3500.6	8676.5	17.88	14.71	31.52
10386.0	-13240178	-7444984	-18715262	26941.7	3530.1	8739.6	17.91	14.76	31.58
10388.0	-13186258	-7437895	-18697719	26977.6	3559.7	8802.8	17.93	14.80	31.63
10390.0	-13132267	-7430746	-18680050	27013.5	3589.3	8866.1	17.96	14.79	31.65
10392.0	-13078204	-7423538	-18662255	27049.4	3618.8	8929.5	18.01	14.78	31.68
10394.0	-13024069	-7416270	-18644332	27085.5	3648.4	8992.9	18.08	14.81	31.72
10396.0	-12969862	-7408944	-18626283	27121.7	3678.1	9056.3	18.11	14.86	31.75
10398.0	-12915583	-7401558	-18608107	27158.0	3707.9	9119.9	18.14	14.90	31.76
10400.0	-12861230	-7394112	-18589804	27194.3	3737.7	9183.4	18.20	14.92	31.79
10402.0	-12806805	-7386607	-18571373	27230.8	3767.6	9247.0	18.26	14.95	31.84
10404.0	-12752307	-7379042	-18552816	27267.3	3797.5	9310.7	18.29	14.98	31.89
10406.0	-12697336	-7371417	-18534130	27303.9	3827.5	9374.5	18.33	15.00	31.91
10408.0	-12643092	-7363732	-18515317	27340.6	3857.5	9438.4	18.38	15.02	31.94
10410.0	-12588373	-7355987	-18496377	27377.4	3887.5	9502.3	18.43	15.03	31.96
10412.0	-12533582	-7348182	-18477308	27414.4	3917.6	9566.3	18.48	15.06	32.00
10414.0	-12478716	-7340317	-18458111	27451.4	3947.7	9630.3	18.55	15.08	32.05

TABLE C-V. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS - SECOND BURN AND TRANSUNAR PHASES (CONT.)

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S	DDXE FT/S SQ	DDYE FT/S SQ	DDZE FT/S SQ
10416.0	-12423776	-7332391	-18438787	27488.5	3977.9	9694.5	18.61	15.12	32.10
10418.0	-12368762	-7324405	-18419333	27525.8	4008.2	9758.7	18.66	15.16	32.14
10420.0	-12313673	-7316358	-18399752	27563.2	4038.6	9823.0	18.69	15.19	32.14
10422.0	-12258509	-7308251	-18380041	27600.6	4069.0	9887.3	18.74	15.21	32.16
10424.0	-12203270	-7300082	-18360202	27638.1	4099.4	9951.7	18.80	15.24	32.23
10426.0	-12147957	-7291853	-18340235	27675.8	4129.9	10016.2	18.87	15.26	32.31
10428.0	-12092567	-7283563	-18320137	27713.6	4160.5	10080.9	18.92	15.29	32.37
10430.0	-12037102	-7275211	-18299911	27751.5	4191.1	10145.6	18.98	15.31	32.37
10432.0	-11981561	-7266798	-18279555	27789.5	4221.7	10210.4	19.04	15.34	32.37
10434.0	-11925944	-7258324	-18259069	27827.7	4252.5	10275.2	19.10	15.38	32.42
10436.0	-11870250	-7249788	-18238454	27865.9	4283.2	10340.1	19.17	15.41	32.49
10438.0	-11814480	-7241191	-18217709	27904.3	4314.1	10405.1	19.24	15.45	32.56
10440.0	-11758633	-7232532	-18196834	27942.9	4345.0	10470.3	19.28	15.48	32.61
10442.0	-11702709	-7223811	-18175828	27981.5	4376.0	10535.5	19.32	15.52	32.64
10444.0	-11646707	-7215028	-18154691	28020.2	4407.1	10600.9	19.38	15.55	32.68
10446.0	-11590628	-7206182	-18133424	28059.0	4438.2	10666.3	19.46	15.58	32.73
10448.0	-11534471	-7197275	-18112026	28098.0	4469.4	10731.7	19.53	15.60	32.77
10450.0	-11478236	-7188305	-18090497	28137.1	4500.6	10797.3	19.59	15.63	32.81
10452.0	-11421922	-7179272	-18068837	28176.4	4531.9	10863.0	19.66	15.66	32.87
10454.0	-11365530	-7170177	-18047045	28215.8	4563.3	10928.8	19.74	15.70	32.93
10456.0	-11309059	-7161019	-18025122	28255.3	4594.7	10994.7	19.82	15.73	33.00
10458.0	-11252509	-7151798	-18003066	28295.0	4626.2	11060.8	19.88	15.77	33.06
10460.0	-11195879	-7142514	-17980879	28334.9	4657.8	11127.0	19.95	15.82	33.13
10462.0	-11139169	-7133167	-17958558	28374.9	4689.5	11193.3	20.05	15.88	33.19
10464.0	-11082379	-7123756	-17936105	28415.1	4721.3	11259.7	20.16	15.93	33.25
10466.0	-11025509	-7114281	-17913519	28455.5	4753.2	11326.3	20.26	15.96	33.32
10468.0	-10968557	-7104743	-17890800	28496.1	4785.1	11393.0	20.36	15.99	33.40
10470.0	-10911524	-7095141	-17867947	28536.9	4817.1	11459.9	20.46	16.01	33.48
10472.0	-10854409	-7085474	-17844960	28577.9	4849.2	11526.9	20.55	16.06	33.55
10474.0	-10797212	-7075744	-17821839	28619.1	4881.4	11594.1	20.60	16.10	33.60
10476.0	-10739933	-7065949	-17798584	28660.4	4913.6	11661.3	20.66	16.14	33.64
10478.0	-10682571	-7056089	-17775194	28701.8	4945.9	11728.6	20.75	16.18	33.70
10480.0	-10625126	-7046165	-17751669	28743.3	4978.3	11796.1	20.83	16.22	33.80
10482.0	-10567597	-7036176	-17728010	28785.1	5010.8	11863.8	20.90	16.25	33.88
10484.0	-10509985	-7026122	-17704214	28827.0	5043.3	11931.7	20.99	16.29	33.96
10486.0	-10452289	-7016003	-17680283	28869.0	5076.0	11999.7	21.09	16.36	34.04
10488.0	-10394509	-7005818	-17656215	28911.3	5108.8	12067.8	21.18	16.46	34.12
10490.0	-10336644	-6995568	-17632011	28953.8	5141.8	12136.2	21.27	16.54	34.21
10492.0	-10278694	-6985251	-17607671	28996.4	5174.9	12204.7	21.37	16.60	34.30
10494.0	-10220658	-6974868	-17583193	29039.2	5208.1	12273.3	21.48	16.63	34.39
10496.0	-10162537	-6964418	-17558577	29082.3	5241.4	12342.2	21.56	16.66	34.50
10498.0	-10104329	-6953902	-17533824	29125.5	5274.8	12411.3	21.63	16.71	34.61
10500.0	-10046035	-6943319	-17508932	29168.8	5308.3	12480.7	21.73	16.78	34.72

TABLE C-V. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS - SECOND BURN AND TRANSUNAR PHASES (CONT.)

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S	DDXE FT/S SQ	DDYE FT/S SQ	DDZE FT/S SQ
10502.0	-9987654	-6932669	-17483901	29212.4	5341.9	12550.2	21.81	16.84	34.83
10504.0	-9929185	-6921951	-17458730	29256.0	5375.6	12620.0	21.87	16.87	34.94
10506.0	-9870629	-6811166	-17433421	29299.8	5409.4	12690.0	21.92	16.92	35.05
10508.0	-9811986	-6900314	-17407970	29343.7	5443.3	12760.2	21.99	16.98	35.15
10510.0	-9753254	-6889393	-17382380	29387.8	5477.3	12830.6	22.07	17.06	35.25
10512.0	-9694435	-6878404	-17356648	29432.0	5511.5	12901.2	22.15	17.14	35.38
10514.0	-9635526	-6867347	-17330775	29476.4	5545.9	12972.1	22.25	17.22	35.52
10516.0	-9576529	-6856220	-17304759	29521.0	5580.4	13043.3	22.36	17.29	35.66
10518.0	-9517442	-6845025	-17278601	29565.8	5615.0	13114.8	22.46	17.34	35.79
10520.0	-9458265	-6833760	-17252300	29610.8	5649.8	13186.5	22.54	17.41	35.92
10522.0	-9398999	-6822426	-17225855	29656.0	5684.7	13258.5	22.63	17.49	36.06
10524.0	-9339641	-6811021	-17199266	29701.4	5719.7	13330.6	22.76	17.56	36.15
10526.0	-9280193	-6799547	-17172532	29747.0	5755.0	13403.2	22.80	17.69	36.42
10528.0	-9220653	-6788001	-17145653	29792.4	5790.6	13476.6	22.87	17.93	36.99
10530.0	-9161023	-6776384	-17118625	29837.6	5826.8	13551.2	22.91	18.20	37.59
10532.0	-9101303	-6764694	-17091447	29882.6	5863.3	13626.7	22.99	18.34	37.92
10534.0	-9041493	-6752930	-17064118	29927.8	5900.0	13702.6	22.66	18.36	37.93
10536.0	-8981592	-6741094	-17036637	29973.3	5936.7	13778.4	22.89	18.36	37.87
10538.0	-8921599	-6729183	-17009005	30019.3	5973.5	13854.1	23.09	18.39	37.89
10540.0	-8861514	-6717200	-16981220	30065.7	6010.3	13930.0	23.28	18.41	37.91
10542.0	-8801336	-6705142	-16953285	30112.4	6047.1	14005.8	23.46	18.42	37.96
10544.0	-8741065	-6693011	-16925197	30159.5	6084.0	14081.7	23.64	18.45	37.98
10546.0	-8680698	-6680806	-16896958	30206.9	6120.9	14157.7	23.83	18.49	38.00
10548.0	-8620237	-6668527	-16868566	30254.7	6158.0	14233.7	24.01	18.52	38.03
10550.0	-8559679	-6656174	-16840023	30302.9	6195.0	14309.7	24.19	18.56	38.06
10552.0	-8499024	-6643747	-16811327	30351.4	6232.2	14385.8	24.37	18.59	38.08
S-IVB 2ND GUIDANCE CUTOFF									
10553.610	-8450126	-6633689	-16788115	30390.7	6262.1	14447.1	24.51	18.62	38.10
10554.0	-8438275	-6631247	-16782480	30394.3	6267.9	14459.0	-6.35	10.82	23.12
10556.0	-8377517	-6618694	-16753527	30366.9	6286.5	14496.2	-14.74	9.11	17.93
10558.0	-8316813	-6606102	-16724499	30337.3	6304.7	14532.1	-14.78	9.10	17.92
10560.0	-8256166	-6593475	-16695398	30307.7	6322.9	14567.8	-14.84	9.09	17.87
10562.0	-8195581	-6580811	-16666227	30277.9	6341.1	14603.5	-14.89	9.06	17.80
TRANSUNAR INJECTION (TLI)									
10563.610	-8146853	-6570590	-16642692	30254.0	6355.6	14632.0	-14.93	9.04	17.75
10600.0	-7059542	-6330857	-16096202	29694.4	6687.7	15263.9	-15.83	8.58	16.56
10650.0	-5595046	-5986025	-15313029	28877.3	7099.8	16048.4	-16.80	7.89	14.80
10700.0	-4172488	-5621463	-14492857	28019.5	7476.7	16743.4	-17.46	7.18	12.99
10750.0	-2793522	-5238960	-13640195	27136.1	7817.4	17348.1	-17.83	6.45	11.20

TABLE C-V. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS - SECOND BURN AND TRANSLUNAR PHASES (CONT.)

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S	DDXE FT/S SQ	DDYE FT/S SQ	DDZE FT/S SQ
10800.0	-1459071	-4840320	-12759531	26241.1	8122.3	17864.0	-17.93	5.74	9.45
10850.0	-169403	-4427311	-11855222	25346.7	8392.4	18294.6	-17.81	5.07	7.79
10900.0	1075786	-4001630	-10931409	24463.5	8629.5	18645.1	-17.49	4.43	6.25
10950.0	2277271	-3564869	-9991950	23593.8	8836.0	18921.5	-17.03	3.84	4.83
11000.0	3436204	-3118499	-9040376	22762.3	9014.3	19130.8	-16.45	3.30	3.56
11050.0	4554016	-2663859	-8079879	21955.7	9167.2	19279.6	-15.80	2.82	2.42
11100.0	5632346	-2202154	-7113306	21183.4	9297.4	19374.9	-15.09	2.39	1.41
11150.0	6672962	-1734458	-6143171	20447.4	9407.3	19423.2	-14.35	2.01	0.54
11200.0	7677111	-1261720	-5171674	19748.8	9499.4	19430.4	-13.59	1.68	-0.23
11250.0	8648473	-784773	-4200725	19087.9	9576.0	19402.1	-12.84	1.39	-0.89
11300.0	9587121	-304343	-3231974	18464.2	9639.1	19343.3	-12.11	1.14	-1.45
11350.0	10495498	178939	-2266831	17876.9	9690.4	19258.4	-11.39	0.92	-1.93
11400.0	11375394	664526	-1306498	17324.7	9731.6	19151.5	-10.70	0.73	-2.34
11450.0	12228531	1151952	-351990	16806.2	9764.2	19026.0	-10.05	0.58	-2.68
11500.0	13056550	1640819	595835	16319.8	9789.3	18884.7	-9.41	0.43	-2.96
11550.0	13861024	2130776	1536264	15864.1	9807.9	18730.5	-8.82	0.31	-3.20
11600.0	14643443	2621524	2468705	15437.3	9821.2	18565.6	-8.26	0.22	-3.39
11650.0	15405209	3112817	3392675	15037.7	9829.9	18391.9	-7.73	0.13	-3.55
11700.0	16147642	3604447	4307779	14663.7	9834.8	18211.2	-7.24	0.06	-3.68
11750.0	16871980	4096238	5213700	14313.7	9836.4	18024.8	-6.77	0.00	-3.77
11800.0	17579387	4588041	6110190	13986.2	9835.3	17834.1	-6.33	-0.05	-3.85
11850.0	18270954	5079728	6997053	13679.8	9831.8	17640.0	-5.93	-0.09	-3.91
11900.0	18947700	5571194	7874146	13393.2	9826.5	17443.4	-5.54	-0.12	-3.95
11950.0	19610581	6062350	8741365	13125.0	9819.5	17245.1	-5.19	-0.15	-3.98
12000.0	20260489	6553127	9598640	12874.1	9811.4	17045.8	-4.85	-0.17	-3.99
12050.0	20898255	7043472	10445932	12639.2	9802.3	16845.9	-4.54	-0.19	-4.00
12100.0	21524659	7533341	11283226	12419.4	9792.4	16645.9	-4.25	-0.21	-4.00
CSM SEPARATION									
12147.200	22106174	7995305	12064423	12224.9	9782.4	16457.4	-3.99	-0.22	-3.99

TABLE C-VI. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS - SECOND BURN AND TRANSUNAR PHASES

TIME SEC	XS NM	YS NM	ZS NM	DXS FT/S	DYS FT/S	DZS FT/S	DDXS FT/S SQ	DDYS FT/S SQ	DDZS FT/S SQ
BEGIN S-IVB RESTART PREPARATIONS --- START OF TIME BASE 6									
9624.800	364.115	-51.966	-3518.747	25470.3	120.1	2620.7	-3.14	0.44	30.35
9630.0	385.907	-51.863	-3516.450	25453.6	122.4	2778.5	-3.33	0.43	30.33
9640.0	427.770	-51.658	-3511.628	25418.5	126.8	3081.5	-3.69	0.43	30.28
9650.0	469.572	-51.445	-3506.307	25379.9	131.2	3384.1	-4.05	0.43	30.24
9660.0	511.308	-51.226	-3500.489	25337.7	135.6	3686.2	-4.41	0.43	30.19
9670.0	552.971	-50.999	-3494.174	25291.8	139.9	3987.8	-4.77	0.43	30.13
9680.0	594.556	-50.765	-3487.363	25242.4	144.3	4288.8	-5.13	0.43	30.07
9690.0	636.057	-50.524	-3480.058	25189.4	148.6	4589.1	-5.49	0.43	30.01
9700.0	677.467	-50.276	-3472.258	25132.8	152.9	4888.9	-5.85	0.42	29.94
9710.0	718.781	-50.021	-3463.966	25072.7	157.2	5187.9	-6.20	0.42	29.87
9720.0	759.994	-49.759	-3455.182	25008.9	161.5	5486.2	-6.56	0.42	29.79
9730.0	801.098	-49.490	-3445.908	24941.7	165.7	5783.7	-6.91	0.42	29.71
9740.0	842.089	-49.213	-3436.145	24870.9	169.9	6080.4	-7.27	0.42	29.63
9750.0	882.961	-48.930	-3425.895	24796.5	174.2	6376.2	-7.62	0.42	29.54
9760.0	923.707	-48.640	-3415.158	24718.7	178.4	6671.1	-7.97	0.41	29.45
9770.0	964.322	-48.343	-3403.937	24637.3	182.5	6965.0	-8.32	0.41	29.35
9780.0	1004.801	-48.039	-3392.233	24552.5	186.7	7258.0	-8.67	0.41	29.25
9790.0	1045.136	-47.729	-3380.047	24464.1	190.8	7549.9	-9.02	0.41	29.14
9800.0	1085.324	-47.411	-3357.382	24372.3	194.9	7840.8	-9.36	0.41	29.03
9810.0	1125.358	-47.087	-3354.239	24277.0	199.0	8130.5	-9.71	0.40	28.92
9820.0	1165.232	-46.756	-3340.620	24178.3	203.1	8419.1	-10.05	0.40	28.80
9830.0	1204.941	-46.419	-3326.528	24076.2	207.1	8706.4	-10.40	0.40	28.68
9840.0	1244.479	-46.074	-3311.963	23970.6	211.1	8992.6	-10.74	0.40	28.55
9850.0	1283.840	-45.724	-3296.929	23861.6	215.1	9277.4	-11.08	0.39	28.42
9860.0	1323.019	-45.366	-3281.427	23749.3	219.1	9560.9	-11.41	0.39	28.29
9870.0	1362.011	-45.002	-3265.459	23633.5	223.0	9843.1	-11.75	0.39	28.15
9880.0	1400.809	-44.632	-3249.028	23514.5	227.0	10123.9	-12.08	0.39	28.01
9890.0	1439.408	-44.255	-3232.136	23392.1	230.8	10403.2	-12.42	0.38	27.86
9900.0	1477.804	-43.872	-3214.786	23266.3	234.7	10681.0	-12.75	0.38	27.71
9910.0	1515.990	-43.483	-3196.980	23137.3	238.5	10957.3	-13.08	0.38	27.56
9920.0	1553.960	-43.087	-3178.720	23005.0	242.3	11232.1	-13.40	0.37	27.40
9930.0	1591.711	-42.685	-3160.009	22869.4	246.1	11505.3	-13.73	0.37	27.24
9940.0	1629.235	-42.277	-3140.850	22730.6	249.8	11776.8	-14.05	0.37	27.07
9950.0	1666.528	-41.863	-3121.246	22588.6	253.5	12046.6	-14.37	0.37	26.90
9960.0	1703.585	-41.443	-3101.199	22443.3	257.2	12314.7	-14.69	0.36	26.73
9970.0	1740.400	-41.016	-3080.712	22294.9	260.9	12581.1	-15.01	0.36	26.55
9980.0	1776.969	-40.584	-3059.788	22143.3	264.5	12845.7	-15.32	0.36	26.37
9990.0	1813.285	-40.146	-3038.431	21988.6	268.0	13108.4	-15.64	0.35	26.18
10000.0	1849.344	-39.702	-3016.642	21830.7	271.6	13369.3	-15.95	0.35	26.00
10010.0	1884.839	-39.335	-2994.391	21677.1	275.6	13618.2	-16.26	0.35	25.81

TABLE C-VI. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS - SECOND BURN AND TRANSUNAR PHASES (CONT.)

TIME SEC	XS NM	YS NM	ZS NM	DXS FT/S	DYS FT/S	DZS FT/S	DDXS FT/S SQ	DDYS FT/S SQ	DDZS FT/S SQ
10020.0	1920.381	-38.878	-2971.766	21513.1	279.1	13875.3	-16.56	0.34	25.61
10030.0	1955.650	-38.416	-2948.720	21346.0	282.5	14130.4	-16.87	0.34	25.41
10040.0	1990.641	-37.949	-2925.256	21175.9	285.9	14383.4	-17.17	0.34	25.21
10050.0	2025.350	-37.475	-2901.377	21002.8	289.3	14634.5	-17.47	0.33	25.00
10060.0	2059.772	-36.996	-2877.087	20826.7	292.6	14883.4	-17.76	0.33	24.81
10070.0	2093.901	-36.512	-2852.388	20647.7	295.9	15130.4	-18.06	0.33	24.58
10080.0	2127.734	-36.022	-2827.285	20465.9	299.2	15375.0	-18.32	0.32	24.36
10090.0	2161.265	-35.527	-2801.782	20281.1	302.4	15617.5	-18.64	0.32	24.14
10100.0	2194.489	-35.027	-2775.880	20093.4	305.6	15857.7	-18.92	0.31	23.91
10110.0	2227.402	-34.521	-2749.586	19902.8	308.8	16095.7	-19.20	0.31	23.69
10120.0	2259.999	-34.010	-2722.901	19709.4	311.9	16331.4	-19.48	0.31	23.45
10130.0	2292.276	-33.495	-2695.831	19513.4	315.0	16564.9	-19.74	0.30	23.24
10140.0	2324.227	-32.974	-2668.378	19314.5	318.0	16796.0	-20.04	0.30	23.01
10150.0	2355.849	-32.448	-2640.547	19113.0	321.0	17024.7	-20.30	0.29	22.74
10160.0	2387.137	-31.917	-2612.341	18908.7	323.9	17251.0	-20.56	0.29	22.51
10170.0	2418.087	-31.382	-2583.765	18701.8	326.8	17474.8	-20.84	0.29	22.26
10180.0	2448.694	-30.841	-2554.823	18492.2	329.7	17696.6	-21.07	0.28	22.00
10190.0	2478.954	-30.296	-2525.518	18280.0	332.5	17915.0	-21.37	0.28	21.78
10200.0	2508.863	-29.747	-2495.856	18065.3	335.3	18131.2	-21.57	0.27	21.49
10202.900	2517.470	-29.587	-2487.187	18002.7	336.0	18193.4	-21.63	0.26	21.41
10204.0	2520.727	-29.526	-2483.891	17981.0	336.4	18219.9	-17.70	0.33	26.88
10206.0	2526.641	-29.415	-2477.885	17958.1	336.9	18283.5	-8.98	0.22	33.78
10208.0	2532.550	-29.304	-2471.855	17940.6	337.3	18351.5	-8.70	0.20	34.13
10210.0	2538.452	-29.193	-2465.804	17923.0	337.7	18419.9	-8.83	0.17	34.26
10212.0	2544.348	-29.082	-2459.730	17905.2	338.0	18488.5	-8.96	0.15	34.39
10214.0	2550.239	-28.970	-2453.633	17887.1	338.3	18557.5	-9.18	0.14	34.64
10216.0	2556.123	-28.859	-2447.513	17868.3	338.6	18627.3	-9.64	0.16	35.20
10218.0	2562.001	-28.748	-2441.370	17848.6	338.9	18698.2	-10.08	0.17	35.73
10220.0	2567.873	-28.636	-2435.203	17828.2	339.3	18769.9	-10.26	0.16	35.94
10222.0	2573.738	-28.524	-2429.013	17807.4	339.6	18841.7	-10.19	0.16	35.86
10224.0	2579.596	-28.412	-2422.800	17787.1	340.0	18913.4	-10.14	0.20	35.79
10226.0	2585.447	-28.300	-2416.562	17766.7	340.4	18985.0	-10.21	0.24	35.82
10228.0	2591.292	-28.188	-2410.302	17746.3	341.0	19056.7	-10.31	0.28	35.90
10230.0	2597.130	-28.076	-2404.017	17725.6	341.6	19128.6	-10.36	0.32	35.95
10232.0	2602.961	-27.963	-2397.709	17704.9	342.2	19200.4	-10.37	0.34	35.93
10234.0	2608.785	-27.851	-2391.377	17684.1	342.9	19272.3	-10.37	0.35	35.91
10236.0	2614.603	-27.738	-2385.022	17663.4	343.7	19344.1	-10.40	0.37	35.90
10238.0	2620.413	-27.624	-2378.643	17642.5	344.4	19415.9	-10.47	0.39	35.92
10240.0	2626.217	-27.511	-2372.240	17621.5	345.2	19487.8	-10.56	0.40	35.96
10242.0	2632.014	-27.397	-2365.813	17600.3	346.0	19559.8	-10.63	0.39	36.01

S-IVB RE-IGNITION (STDV OPEN)



TABLE C-VI. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS - SECOND BURN AND TRANS-LUNAR PHASES (CONT.)

TIME SEC	XS NM	YS NM	ZS NM	DXS FT/S	DYS FT/S	DZS FT/S	DDXS FT/S SQ	DDYS FT/S SQ	DDZS FT/S SQ
10244.0	2637.803	-27.283	-2359.363	17579.1	346.8	19631.8	-10.65	0.40	36.04
10246.0	2643.586	-27.169	-2352.890	17557.8	347.7	19703.9	-10.68	0.43	36.05
10248.0	2649.362	-27.054	-2346.392	17536.4	348.5	19776.0	-10.71	0.45	36.03
10250.0	2655.131	-26.939	-2339.871	17514.9	349.5	19848.0	-10.75	0.47	36.03
10252.0	2660.892	-26.824	-2333.326	17493.4	350.4	19920.1	-10.78	0.49	36.03
10254.0	2666.647	-26.709	-2326.757	17471.8	351.4	19992.1	-10.81	0.50	36.02
10256.0	2672.394	-26.593	-2320.165	17450.1	352.4	20064.1	-10.85	0.52	36.02
10258.0	2678.135	-26.477	-2313.548	17428.4	353.5	20136.1	-10.88	0.53	36.02
10260.0	2683.868	-26.360	-2306.908	17406.9	354.5	20208.9	-9.66	0.49	38.02
10262.0	2689.594	-26.243	-2300.243	17388.2	355.5	20285.4	-9.31	0.49	38.34
10264.0	2695.315	-26.126	-2293.554	17369.5	356.5	20362.1	-9.34	0.50	38.38
10266.0	2701.029	-26.009	-2286.839	17350.8	357.5	20438.9	-9.36	0.51	38.42
10268.0	2706.737	-25.891	-2280.098	17332.1	358.5	20515.8	-9.38	0.51	38.46
10270.0	2712.439	-25.773	-2273.333	17313.3	359.6	20592.7	-9.41	0.53	38.50
10272.0	2718.135	-25.654	-2266.542	17294.4	360.6	20670.0	-9.44	0.54	38.54
10274.0	2723.824	-25.536	-2259.725	17275.5	361.6	20747.1	-9.46	0.54	38.58
10276.0	2729.507	-25.416	-2252.883	17256.6	362.6	20824.3	-9.48	0.52	38.60
10278.0	2735.184	-25.297	-2246.016	17237.6	363.7	20901.5	-9.51	0.52	38.62
10280.0	2740.855	-25.177	-2239.124	17218.5	364.7	20978.7	-9.54	0.53	38.61
10282.0	2746.520	-25.057	-2232.206	17199.4	365.8	21056.0	-9.56	0.56	38.63
10284.0	2752.178	-24.936	-2225.262	17180.3	367.0	21133.3	-9.58	0.58	38.67
10286.0	2757.830	-24.815	-2218.293	17161.1	368.1	21210.6	-9.59	0.58	38.70
10288.0	2763.475	-24.694	-2211.299	17142.0	369.3	21288.1	-9.61	0.58	38.74
10290.0	2769.114	-24.572	-2204.279	17122.7	370.5	21365.6	-9.64	0.57	38.75
10292.0	2774.747	-24.450	-2197.234	17103.4	371.6	21443.1	-9.67	0.57	38.75
10294.0	2780.374	-24.327	-2190.163	17084.1	372.8	21520.6	-9.65	0.57	38.75
10296.0	2785.994	-24.204	-2183.066	17064.8	373.9	21598.0	-9.62	0.57	38.75
10298.0	2791.608	-24.081	-2175.944	17045.6	375.1	21675.5	-9.61	0.57	38.75
10300.0	2797.215	-23.958	-2168.797	17026.4	376.2	21753.0	-9.64	0.59	38.76
10302.0	2802.817	-23.833	-2161.624	17007.0	377.4	21830.6	-9.68	0.60	38.78
10304.0	2808.411	-23.709	-2154.426	16987.6	378.6	21908.2	-9.73	0.60	38.84
10306.0	2814.000	-23.584	-2147.202	16968.2	379.8	21985.9	-9.76	0.58	38.89
10308.0	2819.582	-23.459	-2139.952	16948.6	380.9	22063.7	-9.78	0.56	38.92
10310.0	2825.157	-23.333	-2132.677	16929.1	382.1	22141.6	-9.81	0.58	38.94
10312.0	2830.726	-23.208	-2125.376	16909.4	383.3	22219.5	-9.84	0.60	38.98
10314.0	2836.289	-23.081	-2118.049	16889.7	384.5	22297.5	-9.86	0.59	39.02
10316.0	2841.845	-22.954	-2110.697	16870.0	385.6	22375.6	-9.87	0.57	39.05
10318.0	2847.395	-22.827	-2103.319	16850.2	386.8	22453.7	-9.89	0.56	39.07
10320.0	2852.938	-22.700	-2095.915	16830.4	387.9	22531.9	-9.92	0.57	39.10
10322.0	2858.475	-22.572	-2088.486	16810.6	389.0	22610.1	-9.92	0.59	39.14
10324.0	2864.005	-22.444	-2081.031	16790.8	390.2	22688.4	-9.93	0.60	39.17
10326.0	2869.528	-22.315	-2073.550	16770.9	391.5	22766.8	-9.95	0.61	39.21
10328.0	2875.045	-22.186	-2066.043	16751.0	392.7	22845.2	-9.97	0.60	39.25

TABLE C-VI. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS - SECOND BURN AND TRANSILUNAR PHASES (CONT.)

TIME SEC	XS NM	YS NM	ZS NM	DXS FT/S	DYS FT/S	DZS FT/S	DDXS FT/S SQ	DDYS FT/S SQ	DDZS FT/S SQ
10330.0	2880.556	-22.057	-2058.510	16731.0	393.9	22923.8	-9.99	0.59	39.29
10332.0	2886.059	-21.927	-2050.952	16711.0	395.1	23002.4	-10.02	0.60	39.33
10334.0	2891.557	-21.796	-2043.368	16690.9	396.3	23081.1	-10.05	0.61	39.35
10336.0	2897.047	-21.666	-2035.757	16670.8	397.5	23159.8	-10.07	0.61	39.37
10338.0	2902.531	-21.535	-2028.121	16650.7	398.7	23238.6	-10.08	0.60	39.41
10340.0	2908.009	-21.403	-2020.459	16630.5	399.9	23317.4	-10.10	0.61	39.46
10342.0	2913.479	-21.272	-2012.771	16610.3	401.2	23396.4	-10.13	0.62	39.51
10344.0	2918.944	-21.139	-2005.057	16590.1	402.4	23475.5	-10.13	0.61	39.54
10346.0	2924.401	-21.007	-1997.317	16569.8	403.6	23554.6	-10.13	0.60	39.57
10348.0	2929.852	-20.874	-1989.550	16549.5	404.8	23633.8	-10.16	0.59	39.61
10350.0	2935.296	-20.740	-1981.758	16529.2	406.0	23713.0	-10.18	0.61	39.65
10352.0	2940.733	-20.606	-1973.940	16508.8	407.2	23792.4	-10.18	0.61	39.69
10354.0	2946.164	-20.472	-1966.095	16488.4	408.5	23871.8	-10.18	0.62	39.72
10356.0	2951.588	-20.337	-1958.225	16468.1	409.7	23951.3	-10.21	0.62	39.78
10358.0	2957.005	-20.202	-1950.328	16447.6	410.9	24030.9	-10.24	0.62	39.84
10360.0	2962.415	-20.067	-1942.405	16427.1	412.2	24110.6	-10.26	0.62	39.87
10362.0	2967.819	-19.931	-1934.455	16406.6	413.4	24190.4	-10.27	0.63	39.90
10364.0	2973.216	-19.795	-1926.480	16386.1	414.7	24270.2	-10.26	0.62	39.93
10366.0	2978.606	-19.658	-1918.478	16365.6	415.9	24350.1	-10.25	0.61	39.98
10368.0	2983.990	-19.521	-1910.450	16345.1	417.2	24430.1	-10.26	0.61	40.03
10370.0	2989.367	-19.383	-1902.395	16324.5	418.4	24510.2	-10.27	0.63	40.09
10372.0	2994.737	-19.245	-1894.314	16304.0	419.7	24590.5	-10.28	0.65	40.15
10374.0	3000.100	-19.107	-1886.207	16283.4	421.0	24670.8	-10.29	0.66	40.19
10376.0	3005.456	-18.968	-1878.073	16262.8	422.3	24751.2	-10.33	0.64	40.21
10378.0	3010.806	-18.829	-1869.913	16242.2	423.6	24831.7	-10.34	0.63	40.25
10380.0	3016.149	-18.689	-1861.726	16221.5	424.8	24912.2	-10.32	0.63	40.30
10382.0	3021.485	-18.549	-1853.513	16200.9	426.1	24992.9	-10.31	0.63	40.34
10384.0	3026.814	-18.409	-1845.273	16180.3	427.4	25073.6	-10.32	0.65	40.40
10386.0	3032.136	-18.268	-1837.006	16159.6	428.7	25154.5	-10.35	0.67	40.47
10388.0	3037.452	-18.127	-1828.713	16138.9	430.1	25235.5	-10.39	0.68	40.52
10390.0	3042.761	-17.985	-1820.393	16118.1	431.4	25316.5	-10.39	0.65	40.55
10392.0	3048.063	-17.843	-1812.047	16097.3	432.7	25397.7	-10.38	0.62	40.60
10394.0	3053.358	-17.700	-1803.674	16076.6	433.9	25479.0	-10.37	0.62	40.67
10396.0	3058.646	-17.557	-1795.274	16055.8	435.2	25560.4	-10.39	0.65	40.72
10398.0	3063.928	-17.414	-1786.847	16035.0	436.5	25641.8	-10.39	0.67	40.76
10400.0	3069.202	-17.270	-1778.393	16014.3	437.9	25723.4	-10.38	0.68	40.82
10402.0	3074.470	-17.125	-1769.913	15993.5	439.2	25805.1	-10.39	0.67	40.90
10404.0	3079.731	-16.980	-1761.405	15972.7	440.6	25887.0	-10.41	0.67	40.96
10406.0	3084.985	-16.835	-1752.871	15951.9	441.9	25969.0	-10.41	0.67	41.01
10408.0	3090.233	-16.690	-1744.309	15931.1	443.3	26051.0	-10.41	0.67	41.06
10410.0	3095.473	-16.543	-1735.721	15910.3	444.6	26133.2	-10.40	0.67	41.11
10412.0	3100.707	-16.397	-1727.106	15889.5	445.9	26215.5	-10.40	0.67	41.17
10414.0	3105.933	-16.250	-1718.463	15868.7	447.3	26297.9	-10.40	0.66	41.26

TABLE C-VI. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS - SECOND BURN AND TRANSLUNAR PHASES (CONT.)

TIME SEC	XS NM	YS NM	ZS NM	DXS FT/S	DYS FT/S	DZS FT/S	DDXS FT/S SQ	DDYS FT/S SQ	DDZS FT/S SQ
10416.0	3111.153	-16.102	-1709.793	15847.9	448.6	26380.5	-10.40	0.67	41.34
10418.0	3116.366	-15.955	-1701.096	15827.0	449.9	26463.2	-10.42	0.68	41.40
10420.0	3121.572	-15.806	-1692.372	15806.2	451.3	26546.1	-10.41	0.70	41.43
10422.0	3126.772	-15.657	-1683.621	15785.4	452.7	26629.0	-10.40	0.71	41.48
10424.0	3131.964	-15.508	-1674.842	15764.6	454.1	26712.0	-10.42	0.69	41.57
10426.0	3137.150	-15.358	-1666.036	15743.8	455.5	26795.3	-10.43	0.68	41.67
10428.0	3142.328	-15.208	-1657.202	15722.9	456.9	26878.7	-10.44	0.68	41.76
10430.0	3147.500	-15.058	-1648.341	15702.0	458.2	26962.2	-10.42	0.68	41.80
10432.0	3152.665	-14.907	-1639.452	15681.2	459.6	27045.9	-10.40	0.70	41.84
10434.0	3157.824	-14.755	-1630.536	15660.4	461.0	27129.6	-10.40	0.71	41.92
10436.0	3162.975	-14.603	-1621.592	15639.7	462.4	27213.6	-10.40	0.70	42.02
10438.0	3168.119	-14.451	-1612.621	15618.8	463.8	27297.7	-10.42	0.70	42.19
10440.0	3173.257	-14.298	-1603.622	15598.0	465.2	27382.0	-10.43	0.70	42.12
10442.0	3178.388	-14.144	-1594.595	15577.1	466.7	27466.5	-10.44	0.72	42.25
10444.0	3183.512	-13.991	-1585.540	15556.3	468.1	27551.1	-10.44	0.72	42.32
10446.0	3188.629	-13.836	-1576.458	15535.4	469.5	27635.8	-10.43	0.72	42.41
10448.0	3193.739	-13.682	-1567.347	15514.5	471.0	27720.7	-10.42	0.72	42.48
10450.0	3198.842	-13.526	-1558.209	15493.7	472.4	27805.7	-10.42	0.72	42.56
10452.0	3203.939	-13.371	-1549.042	15472.9	473.9	27890.9	-10.42	0.72	42.65
10454.0	3209.028	-13.214	-1539.848	15452.0	475.3	27976.3	-10.41	0.72	42.75
10456.0	3214.111	-13.058	-1530.625	15431.2	476.7	28061.9	-10.42	0.71	42.86
10458.0	3219.187	-12.900	-1521.374	15410.4	478.2	28147.7	-10.43	0.71	42.95
10460.0	3224.256	-12.743	-1512.095	15389.5	479.6	28233.7	-10.44	0.73	43.05
10462.0	3229.318	-12.585	-1502.787	15368.6	481.1	28319.9	-10.43	0.75	43.18
10464.0	3234.373	-12.426	-1493.451	15347.8	482.6	28406.4	-10.40	0.76	43.30
10466.0	3239.422	-12.267	-1484.087	15327.0	484.1	28493.1	-10.39	0.76	43.42
10468.0	3244.463	-12.107	-1474.694	15306.2	485.6	28580.1	-10.37	0.74	43.54
10470.0	3249.498	-11.947	-1465.272	15285.5	487.1	28667.3	-10.37	0.73	43.67
10472.0	3254.526	-11.787	-1455.822	15264.8	488.5	28754.8	-10.37	0.73	43.78
10474.0	3259.547	-11.626	-1446.343	15244.0	490.0	28842.4	-10.37	0.74	43.86
10476.0	3264.561	-11.464	-1436.834	15223.3	491.5	28930.2	-10.38	0.75	43.94
10478.0	3269.569	-11.302	-1427.297	15202.6	493.0	29018.2	-10.37	0.76	44.04
10480.0	3274.569	-11.140	-1417.731	15181.8	494.5	29106.4	-10.39	0.75	44.17
10482.0	3279.563	-10.977	-1408.136	15161.0	496.0	29194.8	-10.41	0.74	44.29
10484.0	3284.550	-10.813	-1398.512	15140.2	497.5	29283.5	-10.40	0.73	44.41
10486.0	3289.530	-10.649	-1388.858	15119.4	499.0	29372.5	-10.41	0.76	44.55
10488.0	3294.503	-10.485	-1379.175	15098.6	500.5	29461.7	-10.42	0.81	44.69
10490.0	3299.470	-10.320	-1369.463	15077.7	502.2	29551.2	-10.44	0.84	44.83
10492.0	3304.429	-10.154	-1359.721	15056.9	503.9	29641.0	-10.44	0.85	44.96
10494.0	3309.382	-9.988	-1349.950	15036.0	505.6	29731.1	-10.43	0.83	45.11
10496.0	3314.328	-9.821	-1340.149	15015.1	507.2	29821.4	-10.45	0.81	45.24
10498.0	3319.267	-9.654	-1330.318	14994.2	508.8	29912.1	-10.49	0.81	45.38
10500.0	3324.199	-9.486	-1320.457	14973.2	510.5	30003.0	-10.51	0.82	45.54

TABLE C-VI. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS - SECOND BURN AND TRANSLUNAR PHASES (CONT.)

TIME SEC	XS NM	YS NM	ZS NM	DXS FT/S	DYS FT/S	DZS FT/S	DDXS FT/S SQ	DDYS FT/S SQ	DDZS FT/S SQ
10502.0	3329.124	-9.318	-1310.567	14952.1	512.1	30094.2	-10.54	0.83	45.69
10504.0	3334.042	-9.149	-1300.646	14931.0	513.7	30185.7	-10.58	0.81	45.81
10506.0	3338.953	-8.980	-1290.695	14909.8	515.3	30277.4	-10.63	0.80	45.93
10508.0	3343.857	-8.810	-1280.714	14888.5	516.9	30369.4	-10.67	0.81	46.06
10510.0	3348.754	-8.639	-1270.702	14867.2	518.6	30461.7	-10.70	0.83	46.21
10512.0	3353.644	-8.468	-1260.660	14845.7	520.3	30554.2	-10.74	0.85	46.37
10514.0	3358.527	-8.297	-1250.588	14824.2	522.0	30647.2	-10.79	0.86	46.55
10516.0	3363.403	-8.125	-1240.485	14802.6	523.7	30740.5	-10.81	0.86	46.74
10518.0	3368.272	-7.952	-1230.351	14781.0	525.4	30834.1	-10.83	0.85	46.90
10520.0	3373.134	-7.779	-1220.186	14759.2	527.1	30928.1	-10.88	0.85	47.07
10522.0	3377.988	-7.605	-1209.990	14737.5	528.8	31022.4	-10.93	0.87	47.25
10524.0	3382.836	-7.431	-1199.764	14715.7	530.6	31117.0	-10.91	0.89	47.41
10526.0	3387.676	-7.256	-1189.506	14693.7	532.4	31212.1	-11.08	0.90	47.67
10528.0	3392.509	-7.080	-1179.216	14671.0	534.2	31307.9	-11.59	0.90	48.07
10530.0	3397.334	-6.904	-1168.895	14647.3	536.0	31404.4	-12.14	0.91	48.48
10532.0	3402.151	-6.727	-1158.542	14622.8	537.9	31501.6	-12.39	0.92	48.75
10534.0	3406.960	-6.550	-1148.157	14598.1	539.7	31599.2	-12.28	0.92	48.86
10536.0	3411.761	-6.372	-1137.740	14573.6	541.6	31697.1	-12.10	0.93	48.96
10538.0	3416.554	-6.194	-1127.290	14549.6	543.4	31795.1	-11.97	0.94	49.10
10540.0	3421.340	-6.014	-1116.809	14525.8	545.3	31893.5	-11.86	0.93	49.24
10542.0	3426.117	-5.835	-1106.294	14502.1	547.1	31992.1	-11.77	0.91	49.38
10544.0	3430.887	-5.654	-1095.748	14478.7	549.0	32091.0	-11.67	0.92	49.51
10546.0	3435.649	-5.473	-1085.168	14455.5	550.9	32190.1	-11.56	0.94	49.66
10548.0	3440.403	-5.292	-1074.556	14432.5	552.8	32289.5	-11.46	0.94	49.80
10550.0	3445.150	-5.109	-1063.911	14409.7	554.7	32389.2	-11.36	0.95	49.93
10552.0	3449.889	-4.927	-1053.234	14387.0	556.6	32489.2	-11.26	0.96	50.07
S-IVB 2ND GUIDANCE CUTOFF									
10553.610	3453.699	-4.779	-1044.614	14369.0	558.1	32569.8	-11.18	0.96	50.18
10554.0	3454.621	-4.743	-1042.524	14362.0	558.3	32583.1	-24.86	-0.36	17.80
10556.0	3459.339	-4.559	-1031.796	14306.7	558.3	32602.0	-28.03	0.07	8.30
10558.0	3464.039	-4.376	-1021.062	14250.6	558.4	32618.6	-28.05	0.06	8.25
10560.0	3468.720	-4.192	-1010.323	14194.5	558.6	32634.9	-28.07	0.06	8.16
10562.0	3473.383	-4.008	-999.578	14138.3	558.7	32651.1	-28.07	0.06	8.07
TRANSLUNAR INJECTION (TLI)									
10563.610	3477.124	-3.860	-990.925	14093.2	558.8	32664.0	-28.07	0.06	7.99
10600.0	3557.677	-0.264	-794.429	13065.7	568.3	32932.0	-28.02	0.03	6.26
10650.0	3659.451	4.417	-522.307	11673.0	569.0	33186.5	-27.64	-0.00	3.94
10700.0	3749.864	9.096	-248.558	10307.2	568.0	33328.7	-26.95	-0.04	1.78
10750.0	3829.198	13.761	25.931	8982.3	565.5	33367.8	-26.01	-0.07	-0.18

TABLE C-VI. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS - SECOND BURN AND TRANSLUNAR PHASES (CONT.)

TIME SEC	XS NM	YS NM	ZS NM	DXS FT/S	DYS FT/S	DZS FT/S	DDXS FT/S SQ	DDYS FT/S SQ	DDZS FT/S SQ
10800.0	3897.836	18.400	300.352	7709.3	561.6	33314.3	-24.88	-0.09	-1.92
10850.0	3956.241	23.001	573.991	6496.3	556.5	33179.6	-23.62	-0.11	-3.43
10900.0	4004.931	27.556	846.228	5348.8	550.4	32975.3	-22.27	-0.13	-4.71
10950.0	4044.459	32.057	1116.535	4269.9	543.5	32712.6	-20.88	-0.14	-5.77
11000.0	4075.396	36.498	1384.477	3260.7	535.9	32402.2	-19.49	-0.16	-6.62
11050.0	4098.313	40.876	1649.702	2320.5	527.9	32053.6	-18.12	-0.16	-7.30
11100.0	4113.770	45.186	1911.931	1447.5	519.5	31675.4	-16.80	-0.17	-7.81
11150.0	4122.312	49.426	2170.951	639.0	511.0	31275.0	-15.54	-0.17	-8.18
11200.0	4124.455	53.595	2426.608	-108.1	502.3	30858.9	-14.35	-0.17	-8.44
11250.0	4120.691	57.692	2678.795	-797.5	493.5	30432.4	-13.24	-0.17	-8.60
11300.0	4111.478	61.717	2927.445	-1432.9	484.8	30000.1	-12.19	-0.17	-8.68
11350.0	4097.246	65.671	3172.526	-2018.1	476.2	29565.5	-11.23	-0.17	-8.69
11400.0	4078.391	69.554	3414.033	-2556.9	467.6	29131.8	-10.34	-0.17	-8.65
11450.0	4055.282	73.367	3651.982	-3053.0	459.3	28701.2	-9.52	-0.16	-8.57
11500.0	4028.253	77.114	3886.407	-3509.7	451.3	28275.5	-8.76	-0.16	-8.45
11550.0	3997.619	80.794	4117.356	-3930.0	443.2	27856.5	-8.07	-0.16	-8.31
11600.0	3963.665	84.409	4344.888	-4317.1	435.3	27445.2	-7.43	-0.16	-8.14
11650.0	3926.653	87.960	4569.069	-4673.8	427.7	27042.4	-6.85	-0.15	-7.97
11700.0	3886.821	91.449	4789.973	-5002.6	420.4	26648.7	-6.32	-0.15	-7.78
11750.0	3844.390	94.880	5007.676	-5306.0	413.3	26264.5	-5.83	-0.14	-7.59
11800.0	3799.560	98.252	5222.258	-5586.0	406.4	25890.1	-5.38	-0.14	-7.39
11850.0	3752.515	101.569	5433.799	-5844.5	399.7	25525.5	-4.98	-0.14	-7.19
11900.0	3703.426	104.831	5642.380	-6083.3	393.2	25170.7	-4.60	-0.13	-6.99
11950.0	3652.446	108.040	5848.083	-6304.2	386.8	24825.8	-4.26	-0.13	-6.80
12000.0	3599.717	111.198	6050.988	-6508.6	380.7	24490.6	-3.94	-0.12	-6.61
12050.0	3545.370	114.306	6251.174	-6697.8	374.8	24165.0	-3.65	-0.12	-6.42
12100.0	3489.524	117.368	6448.718	-6873.2	369.2	23848.6	-3.39	-0.12	-6.23
12147.200	CSM SEPARATION 3435.527	120.218	6632.835	-7026.9	364.0	23558.3	-3.16	-0.12	-6.06

TABLE C-VII. GEOGRAPHIC POLAR COORDINATES - SECOND BURN AND TRANSUNAR PHASES

TIME SEC	GC DIST NM	LONG DEG E	GC LAT DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	ALTITUDE FT
9624.800	BEGIN S-IVB 3537.918	158.6702	-5.0669	58.87	0.03	24255.6	60.68	0.03	25605.0	571607
9630.0	3537.942	158.9590	-4.8931	58.85	0.03	24255.7	60.65	0.03	25605.1	571717
9640.0	3537.963	159.5140	-4.5584	58.79	0.03	24255.6	60.60	0.03	25605.0	571778
9650.0	3537.985	160.0684	-4.2232	58.74	0.03	24255.6	60.56	0.03	25604.9	571844
9660.0	3538.006	160.6223	-3.8875	58.70	0.03	24255.5	60.52	0.03	25604.8	571913
9670.0	3538.026	161.1757	-3.5514	58.66	0.03	24255.5	60.48	0.03	25604.7	571986
9680.0	3538.047	161.7286	-3.2150	58.62	0.03	24255.4	60.44	0.03	25604.6	572063
9690.0	3538.068	162.2812	-2.8782	58.58	0.03	24255.3	60.41	0.03	25604.5	572144
9700.0	3538.088	162.8334	-2.5411	58.55	0.03	24255.2	60.38	0.03	25604.3	572228
9710.0	3538.108	163.3853	-2.2037	58.53	0.03	24255.1	60.36	0.03	25604.2	572316
9720.0	3538.128	163.9370	-1.8661	58.51	0.03	24255.0	60.34	0.03	25604.1	572409
9730.0	3538.148	164.4883	-1.5283	58.49	0.03	24254.9	60.32	0.03	25604.0	572504
9740.0	3538.168	165.0395	-1.1903	58.47	0.03	24254.8	60.31	0.03	25603.9	572604
9750.0	3538.187	165.5906	-0.8522	58.46	0.03	24254.7	60.29	0.03	25603.8	572707
9760.0	3538.206	166.1415	-0.5140	58.45	0.03	24254.6	60.29	0.03	25603.7	572815
9770.0	3538.225	166.6924	-0.1758	58.45	0.03	24254.5	60.28	0.03	25603.6	572926
9780.0	3538.244	167.2432	0.1624	58.45	0.03	24254.4	60.28	0.03	25603.4	573041
9790.0	3538.263	167.7941	0.5007	58.45	0.03	24254.2	60.29	0.03	25603.3	573160
9800.0	3538.282	168.3450	0.8388	58.46	0.03	24254.1	60.29	0.03	25603.2	573282
9810.0	3538.300	168.8960	1.1769	58.47	0.03	24254.0	60.30	0.02	25603.1	573409
9820.0	3538.318	169.4471	1.5148	58.49	0.03	24253.8	60.32	0.02	25603.0	573539
9830.0	3538.336	169.9984	1.8526	58.50	0.03	24253.7	60.34	0.02	25602.9	573672
9840.0	3538.354	170.5500	2.1902	58.53	0.03	24253.5	60.36	0.02	25602.7	573810
9850.0	3538.372	171.1018	2.5275	58.55	0.03	24253.4	60.38	0.02	25602.6	573951
9860.0	3538.389	171.6539	2.8646	58.58	0.02	24253.2	60.41	0.02	25602.5	574096
9870.0	3538.406	172.2064	3.2013	58.62	0.02	24253.0	60.44	0.02	25602.4	574245
9880.0	3538.423	172.7592	3.5377	58.65	0.02	24252.9	60.48	0.02	25602.2	574397
9890.0	3538.440	173.3125	3.8738	58.70	0.02	24252.7	60.52	0.02	25602.1	574553
9900.0	3538.457	173.8662	4.2094	58.74	0.02	24252.5	60.56	0.02	25602.0	574712
9910.0	3538.473	174.4204	4.5445	58.79	0.02	24252.3	60.60	0.02	25601.9	574874
9920.0	3538.490	174.9752	4.8791	58.84	0.02	24252.2	60.65	0.02	25601.7	575041
9930.0	3538.506	175.5306	5.2132	58.90	0.02	24252.0	60.70	0.02	25601.6	575210
9940.0	3538.522	176.0866	5.5468	58.96	0.02	24251.8	60.76	0.02	25601.5	575383
9950.0	3538.537	176.6433	5.8797	59.02	0.02	24251.6	60.82	0.02	25601.3	575559
9960.0	3538.553	177.2007	6.2120	59.09	0.02	24251.4	60.88	0.02	25601.2	575739
9970.0	3538.568	177.7588	6.5436	59.16	0.02	24251.2	60.95	0.02	25601.1	575922
9980.0	3538.583	178.3178	6.8745	59.24	0.02	24250.9	61.02	0.02	25600.9	576107
9990.0	3538.598	178.8775	7.2047	59.32	0.02	24250.7	61.10	0.02	25600.8	576296
10000.0	3538.612	179.4382	7.5340	59.40	0.02	24250.5	61.17	0.02	25600.6	576489
10010.0	3538.638	179.9957	7.8619	59.49	0.05	24251.2	61.25	0.04	25601.3	575535

TABLE C-VII. GEOGRAPHIC POLAR COORDINATES - SECOND BURN AND TRANSUNAR PHASES (CONT.)

TIME SEC	GC DIST NM	LONG DEG E	GC LAT DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	ALTITUDE FT
10202.0	3538.470	-179.4418	8.1895	59.58	0.05	24250.8	61.34	0.04	25601.1	575840
10300.0	3538.502	-178.8783	8.5163	59.67	0.05	24250.4	61.43	0.04	25600.8	576149
10400.0	3538.533	-178.3137	8.8421	59.77	0.05	24250.0	61.52	0.04	25600.5	576460
10500.0	3538.564	-177.7481	9.1669	59.88	0.04	24249.6	61.61	0.04	25600.2	576773
10600.0	3538.595	-177.1814	9.4907	59.98	0.04	24249.2	61.71	0.04	25599.9	577090
10700.0	3538.626	-176.6135	9.8135	60.09	0.04	24248.9	61.82	0.04	25599.7	577408
10800.0	3538.657	-176.0445	10.1351	60.21	0.04	24248.6	61.92	0.04	25599.5	577728
10900.0	3538.687	-175.4742	10.4556	60.32	0.04	24248.2	62.03	0.04	25599.2	578052
11000.0	3538.717	-174.9027	10.7749	60.44	0.04	24247.8	62.15	0.04	25598.9	578378
11100.0	3538.747	-174.3299	11.0930	60.57	0.04	24247.4	62.26	0.04	25598.6	578706
11200.0	3538.777	-173.7558	11.4099	60.70	0.04	24246.9	62.38	0.04	25598.3	579037
11300.0	3538.807	-173.1803	11.7254	60.83	0.04	24246.7	62.51	0.04	25598.2	579369
11400.0	3538.836	-172.6034	12.0396	60.97	0.04	24246.3	62.63	0.04	25598.0	579703
11500.0	3538.865	-172.0251	12.3525	61.11	0.04	24246.1	62.77	0.04	25597.9	580039
11600.0	3538.894	-171.4453	12.6639	61.25	0.04	24245.8	62.90	0.04	25597.7	580376
11700.0	3538.923	-170.8640	12.9739	61.40	0.04	24245.5	63.04	0.04	25597.5	580716
11800.0	3538.951	-170.2811	13.2823	61.55	0.04	24245.2	63.18	0.04	25597.4	581056
11900.0	3538.980	-169.6967	13.5893	61.71	0.04	24244.9	63.33	0.04	25597.2	581398
12000.0	3539.008	-169.1106	13.8946	61.87	0.04	24244.6	63.48	0.04	25597.1	581742
12020.900	3539.016	-168.9404	13.9829	61.92	0.04	24244.6	63.52	0.04	25597.1	581841
10204.0	3539.019	-168.8757	14.0163	61.94	0.04	24248.2	63.54	0.04	25600.7	581880
10206.0	3539.024	-168.7581	14.0771	61.97	0.04	24277.4	63.57	0.04	25630.0	581950
10208.0	3539.030	-168.6403	14.1379	62.00	0.04	24313.7	63.60	0.04	25666.2	582021
10210.0	3539.036	-168.5222	14.1988	62.04	0.04	24350.3	63.63	0.04	25702.9	582093
10212.0	3539.043	-168.4038	14.2596	62.07	0.05	24387.2	63.66	0.04	25739.8	582167
10214.0	3539.049	-168.2852	14.3205	62.11	0.05	24424.2	63.69	0.05	25776.8	582243
10216.0	3539.056	-168.1664	14.3814	62.14	0.05	24461.4	63.72	0.05	25814.1	582320
10218.0	3539.063	-168.0473	14.4423	62.18	0.05	24499.0	63.75	0.04	25851.7	582396
10220.0	3539.069	-167.9279	14.5033	62.21	0.04	24536.9	63.78	0.04	25889.6	582469
10222.0	3539.074	-167.8083	14.5643	62.25	0.04	24574.7	63.81	0.03	25927.4	582538
10224.0	3539.079	-167.6885	14.6252	62.28	0.03	24612.9	63.84	0.03	25965.6	582604
10226.0	3539.083	-167.5683	14.6863	62.32	0.03	24651.2	63.87	0.03	26003.9	582668
10228.0	3539.088	-167.4480	14.7473	62.35	0.03	24689.6	63.90	0.03	26042.4	582731
10230.0	3539.092	-167.3273	14.8084	62.39	0.03	24728.1	63.93	0.03	26080.9	582792
10232.0	3539.095	-167.2064	14.8694	62.43	0.03	24766.8	63.97	0.02	26119.7	582851
10234.0	3539.099	-167.0852	14.9305	62.46	0.02	24805.6	64.00	0.02	26158.5	582910
10236.0	3539.102	-166.9638	14.9917	62.50	0.02	24844.5	64.03	0.02	26197.5	582968
10238.0	3539.106	-166.8421	15.0528	62.54	0.02	24883.6	64.06	0.02	26236.5	583027
10240.0	3539.109	-166.7201	15.1140	62.58	0.03	24922.7	64.10	0.02	26275.7	583086
10242.0	3539.113	-166.5979	15.1751	62.62	0.03	24961.9	64.13	0.02	26314.9	583147

S-IVB RE-IGNITION (STDV OPEN)

TABLE C-VII. GEOGRAPHIC POLAR COORDINATES - SECOND BURN AND TRANSUNAR PHASES (CONT.)

TIME SEC	GC DIST NM	LONG DEG E	GC LAT DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	ALTITUDE FT
10244.0	3539.117	-166.4753	15.2363	62.65	0.03	25001.3	64.17	0.03	26354.4	583208
10246.0	3539.121	-166.3526	15.2975	62.69	0.03	25040.8	64.20	0.03	26393.9	583271
10248.0	3539.125	-166.2295	15.3588	62.73	0.03	25080.4	64.23	0.03	26433.6	583336
10250.0	3539.130	-166.1062	15.4200	62.77	0.03	25120.2	64.27	0.03	26473.4	583403
10252.0	3539.135	-165.9826	15.4813	62.81	0.04	25160.0	64.30	0.04	26513.2	583473
10254.0	3539.141	-165.8587	15.5425	62.85	0.04	25199.9	64.34	0.04	26553.1	583547
10256.0	3539.147	-165.7345	15.6038	62.89	0.05	25239.9	64.37	0.04	26593.2	583624
10258.0	3539.154	-165.6101	15.6651	62.93	0.05	25280.0	64.41	0.05	26633.4	583706
10260.0	3539.162	-165.4853	15.7264	62.97	0.06	25321.0	64.45	0.05	26674.4	583792
10262.0	3539.170	-165.3603	15.7877	63.01	0.06	25366.9	64.48	0.06	26720.3	583883
10264.0	3539.180	-165.2350	15.8491	63.06	0.07	25413.0	64.52	0.06	26766.5	583979
10266.0	3539.190	-165.1093	15.9105	63.10	0.07	25459.3	64.56	0.07	26812.9	584081
10268.0	3539.201	-164.9834	15.9719	63.14	0.08	25505.8	64.59	0.08	26859.4	584189
10270.0	3539.213	-164.8571	16.0333	63.18	0.09	25552.5	64.63	0.08	26906.1	584303
10272.0	3539.227	-164.7305	16.0947	63.22	0.09	25599.5	64.67	0.09	26953.2	584424
10274.0	3539.241	-164.6036	16.1562	63.27	0.10	25646.6	64.70	0.10	27000.3	584553
10276.0	3539.257	-164.4764	16.2177	63.31	0.11	25693.8	64.74	0.11	27047.6	584690
10278.0	3539.274	-164.3488	16.2792	63.35	0.12	25741.2	64.78	0.12	27095.0	584836
10280.0	3539.293	-164.2209	16.3407	63.39	0.13	25788.7	64.82	0.13	27142.5	584990
10282.0	3539.313	-164.0927	16.4023	63.44	0.14	25836.3	64.86	0.14	27190.2	585155
10284.0	3539.335	-163.9642	16.4638	63.48	0.15	25884.1	64.89	0.15	27238.1	585331
10286.0	3539.359	-163.8353	16.5254	63.53	0.17	25932.1	64.93	0.16	27286.1	585517
10288.0	3539.385	-163.7062	16.5870	63.57	0.18	25980.2	64.97	0.17	27334.3	585715
10290.0	3539.413	-163.5767	16.6487	63.62	0.19	26028.6	65.01	0.18	27382.7	585926
10292.0	3539.443	-163.4468	16.7103	63.66	0.21	26077.0	65.05	0.20	27431.2	586149
10294.0	3539.475	-163.3166	16.7720	63.71	0.22	26125.6	65.09	0.21	27479.8	586386
10296.0	3539.509	-163.1861	16.8336	63.75	0.24	26174.3	65.13	0.23	27528.6	586637
10298.0	3539.546	-163.0553	16.8953	63.80	0.25	26223.2	65.17	0.24	27577.6	586904
10300.0	3539.586	-162.9241	16.9570	63.84	0.27	26272.3	65.21	0.26	27626.7	587186
10302.0	3539.628	-162.7926	17.0187	63.89	0.29	26321.5	65.25	0.27	27675.9	587485
10304.0	3539.673	-162.6607	17.0805	63.93	0.31	26370.8	65.30	0.29	27725.3	587801
10306.0	3539.721	-162.5285	17.1422	63.98	0.33	26420.3	65.34	0.31	27774.9	588135
10308.0	3539.772	-162.3959	17.2040	64.03	0.34	26470.0	65.38	0.33	27824.6	588487
10310.0	3539.826	-162.2630	17.2657	64.08	0.36	26519.8	65.42	0.35	27874.5	588858
10312.0	3539.883	-162.1298	17.3275	64.12	0.39	26569.8	65.46	0.37	27924.6	589249
10314.0	3539.944	-161.9962	17.3893	64.17	0.41	26620.0	65.51	0.39	27974.8	589659
10316.0	3540.007	-161.8623	17.4511	64.22	0.43	26670.3	65.55	0.41	28025.2	590090
10318.0	3540.075	-161.7280	17.5129	64.27	0.45	26720.8	65.59	0.43	28075.8	590543
10320.0	3540.146	-161.5934	17.5747	64.31	0.47	26771.5	65.63	0.45	28126.5	591018
10322.0	3540.220	-161.4584	17.6365	64.36	0.50	26822.3	65.68	0.47	28177.4	591515
10324.0	3540.299	-161.3230	17.6983	64.41	0.52	26873.3	65.72	0.50	28228.5	592036
10326.0	3540.381	-161.1873	17.7602	64.46	0.55	26924.5	65.77	0.52	28279.7	592580
10328.0	3540.468	-161.0513	17.8220	64.51	0.57	26975.9	65.81	0.54	28331.2	593150



TABLE C-VII. GEOGRAPHIC POLAR COORDINATES - SECOND BURN AND TRANSILUNAR PHASES (CONT.)

TIME SEC	GC DIST NM	LONG DEG E	GC LAT DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	ALTITUDE FT
10330.0	3540.558	-160.9148	17.8838	64.56	0.60	27027.4	65.86	0.57	28382.8	593744
10332.0	3540.653	-160.7781	17.9457	64.61	0.62	27079.1	65.90	0.59	28434.6	594365
10334.0	3540.752	-160.6409	18.0075	64.66	0.65	27131.0	65.95	0.62	28486.5	595013
10336.0	3540.856	-160.5034	18.0694	64.71	0.68	27183.0	65.99	0.65	28538.6	595687
10338.0	3540.964	-160.3655	18.1312	64.76	0.71	27235.2	66.04	0.67	28590.8	596390
10340.0	3541.077	-160.2273	18.1930	64.81	0.74	27287.5	66.08	0.70	28643.3	597122
10342.0	3541.195	-160.0887	18.2549	64.86	0.77	27340.1	66.13	0.73	28695.9	597883
10344.0	3541.318	-159.9497	18.3167	64.92	0.80	27392.8	66.17	0.76	28748.7	598674
10346.0	3541.445	-159.8104	18.3786	64.97	0.83	27445.7	66.22	0.79	28801.7	599495
10348.0	3541.578	-159.6707	18.4404	65.02	0.86	27498.8	66.27	0.82	28854.9	600349
10350.0	3541.717	-159.5306	18.5022	65.07	0.89	27552.1	66.32	0.85	28908.2	601234
10352.0	3541.860	-159.3901	18.5641	65.12	0.92	27605.5	66.36	0.88	28961.8	602153
10354.0	3542.009	-159.2492	18.6259	65.18	0.96	27659.1	66.41	0.91	29015.5	603105
10356.0	3542.164	-159.1080	18.6877	65.23	0.99	27713.0	66.46	0.94	29069.4	604092
10358.0	3542.325	-158.9664	18.7495	65.28	1.02	27767.0	66.51	0.98	29123.5	605113
10360.0	3542.491	-158.8244	18.8113	65.34	1.06	27821.2	66.56	1.01	29177.8	606171
10362.0	3542.664	-158.6821	18.8731	65.39	1.10	27875.5	66.60	1.04	29232.2	607265
10364.0	3542.842	-158.5393	18.9349	65.45	1.13	27930.0	66.65	1.08	29286.8	608396
10366.0	3543.027	-158.3962	18.9966	65.50	1.17	27984.8	66.70	1.12	29341.7	609566
10368.0	3543.218	-158.2527	19.0584	65.56	1.21	28039.7	66.75	1.15	29396.7	610774
10370.0	3543.416	-158.1088	19.1201	65.61	1.25	28094.9	66.80	1.19	29452.0	612023
10372.0	3543.620	-157.9645	19.1818	65.67	1.28	28150.2	66.85	1.23	29507.4	613311
10374.0	3543.831	-157.8198	19.2435	65.72	1.32	28205.8	66.90	1.26	29563.1	614641
10376.0	3544.049	-157.6747	19.3052	65.78	1.36	28261.5	66.95	1.30	29618.9	616013
10378.0	3544.274	-157.5292	19.3669	65.83	1.41	28317.4	67.01	1.34	29674.9	617427
10380.0	3544.506	-157.3833	19.4286	65.89	1.45	28373.5	67.06	1.38	29731.1	618885
10382.0	3544.746	-157.2371	19.4902	65.95	1.49	28429.7	67.11	1.42	29787.5	620388
10384.0	3544.993	-157.0904	19.5518	66.01	1.53	28486.3	67.16	1.46	29844.1	621935
10386.0	3545.247	-156.9433	19.6134	66.06	1.58	28543.0	67.21	1.50	29900.9	623529
10388.0	3545.509	-156.7958	19.6750	66.12	1.62	28599.8	67.27	1.55	29957.9	625169
10390.0	3545.779	-156.6480	19.7365	66.18	1.66	28656.9	67.32	1.59	30015.1	626857
10392.0	3546.057	-156.4997	19.7981	66.24	1.71	28714.2	67.37	1.63	30072.5	628593
10394.0	3546.343	-156.3510	19.8595	66.30	1.75	28771.7	67.43	1.68	30130.1	630379
10396.0	3546.637	-156.2019	19.9210	66.35	1.80	28829.4	67.48	1.72	30187.9	632214
10398.0	3546.939	-156.0524	19.9825	66.41	1.85	28887.3	67.53	1.77	30245.9	634100
10400.0	3547.250	-155.9025	20.0439	66.47	1.90	28945.4	67.59	1.81	30304.2	636038
10402.0	3547.570	-155.7522	20.1052	66.53	1.94	29003.7	67.64	1.86	30362.7	638028
10404.0	3547.898	-155.6015	20.1666	66.59	1.99	29062.3	67.70	1.90	30421.3	640072
10406.0	3548.235	-155.4503	20.2279	66.65	2.04	29121.1	67.75	1.95	30480.3	642170
10408.0	3548.582	-155.2987	20.2892	66.72	2.09	29180.0	67.81	2.00	30539.4	644323
10410.0	3548.937	-155.1468	20.3504	66.78	2.14	29239.2	67.87	2.05	30598.7	646531
10412.0	3549.302	-154.9944	20.4116	66.84	2.20	29298.6	67.92	2.10	30658.2	648797
10414.0	3549.676	-154.8416	20.4728	66.90	2.25	29358.2	67.98	2.15	30718.0	651120

TABLE C-VII. GEOGRAPHIC POLAR COORDINATES - SECOND BURN AND TRANSUNAR PHASES (CONT.)

TIME SEC	GC DIST NM	LONG DEG E	GC LAT DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	ALTITUDE FT
10416.0	3550.060	-154.6883	20.5339	66.96	2.30	29418.1	68.04	2.20	30778.0	653502
10418.0	3550.454	-154.5347	20.5950	67.02	2.35	29478.3	68.09	2.25	30838.3	655943
10420.0	3550.857	-154.3806	20.6561	67.09	2.41	29538.6	68.15	2.30	30898.8	658445
10422.0	3551.271	-154.2261	20.7171	67.15	2.46	29599.1	68.21	2.35	30959.4	661008
10424.0	3551.695	-154.0711	20.7781	67.21	2.52	29659.9	68.27	2.41	31020.3	663632
10426.0	3552.129	-153.9158	20.8390	67.28	2.57	29720.9	68.32	2.46	31081.5	666320
10428.0	3552.573	-153.7600	20.8998	67.34	2.63	29782.2	68.38	2.52	31142.9	669072
10430.0	3553.029	-153.6037	20.9607	67.40	2.69	29843.7	68.44	2.57	31204.6	671888
10432.0	3553.495	-153.4471	21.0214	67.47	2.75	29905.4	68.50	2.63	31266.5	674770
10434.0	3553.972	-153.2900	21.0822	67.53	2.80	29967.3	68.56	2.68	31328.6	677718
10436.0	3554.460	-153.1325	21.1428	67.60	2.86	30029.6	68.62	2.74	31391.0	680734
10438.0	3554.959	-152.9745	21.2034	67.66	2.92	30092.0	68.68	2.80	31453.6	683815
10440.0	3555.470	-152.8161	21.2640	67.73	2.98	30154.8	68.74	2.85	31516.5	686973
10442.0	3555.992	-152.6573	21.3245	67.80	3.04	30217.7	68.80	2.91	31579.6	690197
10444.0	3556.526	-152.4980	21.3850	67.86	3.11	30280.9	68.87	2.97	31643.0	693492
10446.0	3557.072	-152.3383	21.4453	67.93	3.17	30344.3	68.93	3.03	31706.5	696859
10448.0	3557.630	-152.1781	21.5057	68.00	3.23	30408.0	68.99	3.09	31770.4	700299
10450.0	3558.200	-152.0175	21.5659	68.06	3.29	30471.9	69.05	3.15	31834.5	703813
10452.0	3558.783	-151.8565	21.6261	68.13	3.36	30536.1	69.11	3.21	31898.8	707402
10454.0	3559.377	-151.6950	21.6863	68.20	3.42	30600.5	69.18	3.28	31963.5	711067
10456.0	3559.985	-151.5330	21.7463	68.27	3.49	30665.3	69.24	3.34	32028.4	714809
10458.0	3560.605	-151.3706	21.8063	68.34	3.55	30730.3	69.30	3.40	32093.6	718629
10460.0	3561.238	-151.2078	21.8663	68.41	3.62	30795.6	69.37	3.46	32159.1	722527
10462.0	3561.885	-151.0445	21.9261	68.48	3.69	30861.2	69.43	3.53	32224.9	726505
10464.0	3562.544	-150.8807	21.9859	68.55	3.75	30927.1	69.50	3.59	32291.0	730564
10466.0	3563.217	-150.7165	22.0456	68.62	3.82	30993.4	69.56	3.66	32357.5	734704
10468.0	3563.904	-150.5519	22.1053	68.69	3.89	31060.1	69.63	3.73	32424.4	738926
10470.0	3564.604	-150.3867	22.1649	68.76	3.96	31127.0	69.69	3.79	32491.5	743233
10472.0	3565.318	-150.2212	22.2243	68.83	4.03	31194.3	69.76	3.86	32559.0	747623
10474.0	3566.047	-150.0551	22.2837	68.90	4.10	31261.8	69.83	3.93	32626.7	752100
10476.0	3566.789	-149.8886	22.3431	68.97	4.17	31329.6	69.89	3.99	32694.7	756663
10478.0	3567.546	-149.7217	22.4023	69.04	4.24	31397.7	69.96	4.06	32763.0	761313
10480.0	3568.318	-149.5542	22.4615	69.12	4.31	31466.0	70.03	4.13	32831.6	766052
10482.0	3569.104	-149.3863	22.5205	69.19	4.39	31534.7	70.10	4.20	32900.5	770881
10484.0	3569.905	-149.2180	22.5795	69.26	4.46	31603.7	70.16	4.27	32969.7	775800
10486.0	3570.721	-149.0492	22.6384	69.34	4.53	31673.0	70.23	4.34	33039.2	780811
10488.0	3571.552	-148.8799	22.6972	69.41	4.61	31742.6	70.30	4.42	33109.1	785914
10490.0	3572.399	-148.7101	22.7559	69.48	4.68	31812.6	70.37	4.49	33179.3	791110
10492.0	3573.262	-148.5399	22.8145	69.56	4.76	31883.0	70.44	4.56	33249.9	796401
10494.0	3574.140	-148.3692	22.8731	69.63	4.83	31953.7	70.51	4.63	33320.8	801787
10496.0	3575.033	-148.1980	22.9315	69.71	4.91	32024.7	70.58	4.71	33392.0	807269
10498.0	3575.943	-148.0263	22.9898	69.79	4.98	32096.1	70.65	4.78	33463.6	812849
10500.0	3576.869	-147.8542	23.0480	69.86	5.06	32167.8	70.72	4.85	33535.6	818528

TABLE C-VII. GEOGRAPHIC POLAR COORDINATES - SECOND BURN AND TRANSUNAR PHASES (CONT.)

TIME SEC	GC DIST NM	LONG DEG E	GC LAT DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	ALTITUDE FT
10502.0	3577.812	-147.6815	23.1061	69.94	5.14	32239.8	70.79	4.93	33607.9	824305
10504.0	3578.770	-147.5085	23.1641	70.02	5.22	32312.2	70.87	5.00	33680.5	830182
10506.0	3579.746	-147.3349	23.2220	70.09	5.30	32384.8	70.94	5.08	33753.4	836161
10508.0	3580.738	-147.1608	23.2798	70.17	5.37	32457.8	71.01	5.16	33826.6	842241
10510.0	3581.747	-146.9863	23.3375	70.25	5.45	32531.0	71.08	5.23	33900.1	848425
10512.0	3582.774	-146.8113	23.3951	70.33	5.53	32604.6	71.16	5.31	33973.9	854712
10514.0	3583.817	-146.6358	23.4525	70.40	5.61	32678.6	71.23	5.39	34048.2	861104
10516.0	3584.878	-146.4598	23.5099	70.48	5.69	32753.0	71.30	5.46	34122.8	867602
10518.0	3585.957	-146.2833	23.5671	70.56	5.78	32827.8	71.38	5.54	34197.9	874206
10520.0	3587.053	-146.1063	23.6242	70.64	5.86	32903.0	71.45	5.62	34273.3	880918
10522.0	3588.167	-145.9289	23.6812	70.72	5.94	32978.5	71.53	5.70	34349.1	887739
10524.0	3589.299	-145.7509	23.7380	70.80	6.02	33054.4	71.60	5.78	34425.3	894669
10526.0	3590.449	-145.5725	23.7947	70.88	6.10	33130.8	71.68	5.86	34501.9	901709
10528.0	3591.618	-145.3935	23.8513	70.97	6.18	33207.5	71.76	5.94	34579.0	908861
10530.0	3592.804	-145.2141	23.9078	71.05	6.26	33284.7	71.83	6.02	34656.4	916122
10532.0	3594.009	-145.0342	23.9642	71.13	6.34	33362.2	71.91	6.09	34734.2	923492
10534.0	3595.231	-144.8538	24.0204	71.21	6.42	33440.1	71.99	6.17	34812.4	930971
10536.0	3596.472	-144.6728	24.0764	71.29	6.50	33518.5	72.07	6.25	34891.1	938560
10538.0	3597.731	-144.4914	24.1324	71.38	6.59	33597.3	72.14	6.33	34970.2	946261
10540.0	3599.009	-144.3095	24.1882	71.46	6.67	33676.6	72.22	6.41	35049.8	954077
10542.0	3600.305	-144.1271	24.2438	71.55	6.75	33756.3	72.30	6.49	35129.8	962008
10544.0	3601.622	-143.9441	24.2993	71.63	6.84	33836.4	72.38	6.57	35210.3	970056
10546.0	3602.957	-143.7607	24.3547	71.71	6.92	33917.0	72.46	6.65	35291.2	978223
10548.0	3604.313	-143.5768	24.4099	71.80	7.01	33998.0	72.54	6.74	35372.5	986511
10550.0	3605.689	-143.3923	24.4650	71.88	7.10	34079.5	72.62	6.82	35454.3	994921
10552.0	3607.085	-143.2074	24.5199	71.97	7.19	34161.4	72.70	6.91	35536.5	1003455
S-IVB 2ND GUIDANCE CUTOFF										
10553.610	3608.224	-143.0581	24.5640	72.04	7.26	34227.6	72.77	6.98	35603.0	1010416
10554.0	3608.502	-143.0219	24.5747	72.06	7.27	34236.9	72.78	6.99	35612.3	1012115
10556.0	3609.938	-142.8362	24.6292	72.14	7.37	34231.7	72.86	7.08	35607.4	1020891
10558.0	3611.392	-142.6505	24.6835	72.22	7.46	34224.0	72.94	7.17	35600.0	1029779
10560.0	3612.865	-142.4648	24.7374	72.31	7.56	34216.3	73.03	7.27	35592.6	1038777
10562.0	3614.355	-142.2790	24.7911	72.39	7.65	34208.5	73.11	7.36	35585.1	1047885
TRANSUNAR INJECTION (TLI)										
10563.610	3615.568	-142.1295	24.8341	72.46	7.73	34202.2	73.17	7.43	35579.1	1055296
10600.0	3645.296	-138.7523	25.7497	74.04	9.42	34051.0	74.69	9.05	35433.8	1236792
10650.0	3696.539	-134.1330	26.8484	76.26	11.73	33791.4	76.84	11.26	35184.1	1549224
10700.0	3758.103	-129.5753	27.7544	78.53	13.97	33486.3	79.03	13.39	34890.8	1924202
10750.0	3829.310	-125.1141	28.4715	80.82	16.13	33142.7	81.23	15.46	34560.3	2357596

TABLE C-VII. GEOGRAPHIC POLAR COORDINATES - SECOND BURN AND TRANSLUNAR PHASES

TIME SEC	GC DIST NM	LONG DEG E.	GC LAT DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	ALTITUDE FT
10800.0	3909.435	-120.7804	29.0086	83.10	18.23	32767.1	83.42	17.44	34199.3	2844995
10850.0	3997.729	-116.6001	29.3783	85.34	20.24	32366.3	85.56	19.34	33814.2	3381871
10900.0	4093.450	-112.5930	29.5963	87.52	22.17	31946.3	87.64	21.15	33410.8	3963711
10950.0	4195.871	-108.7733	29.6795	89.62	24.02	31512.7	89.64	22.87	32994.6	4586117
11000.0	4304.296	-105.1492	29.6455	91.63	25.78	31070.3	91.54	24.51	32570.3	5244886
11050.0	4418.071	-101.7242	29.5112	93.54	27.47	30623.4	93.33	26.07	32141.8	5936057
11100.0	4536.587	-98.4973	29.2926	95.35	29.08	30175.6	95.02	27.55	31712.7	6655945
11150.0	4659.284	-95.4646	29.0044	97.07	30.62	29729.7	96.60	28.95	31285.7	7401161
11200.0	4785.648	-92.6195	28.6598	98.68	32.09	29288.1	98.07	30.28	30863.2	8168610
11250.0	4915.218	-89.9536	28.2703	100.20	33.50	28852.9	99.45	31.53	30446.9	8955486
11300.0	5047.574	-87.4578	27.8457	101.62	34.84	28425.3	100.72	32.72	30038.2	9759264
11350.0	5182.341	-85.1220	27.3947	102.97	36.12	28006.7	101.90	33.85	29638.1	10577673
11400.0	5319.186	-82.9363	26.9243	104.23	37.35	27597.6	103.00	34.92	29247.5	11408687
11450.0	5457.808	-80.8906	26.4405	105.42	38.53	27198.8	104.01	35.94	28866.7	12250493
11500.0	5597.940	-78.9753	25.9483	106.54	39.66	26810.4	104.95	36.90	28496.1	13101475
11550.0	5739.347	-77.1811	25.4517	107.61	40.75	26432.9	105.82	37.82	28135.8	13960205
11600.0	5881.821	-75.4993	24.9540	108.62	41.79	26066.2	106.62	38.69	27786.1	14825418
11650.0	6025.175	-73.9217	24.4579	109.57	42.80	25710.3	107.37	39.52	27446.6	15695990
11700.0	6169.245	-72.4406	23.9655	110.49	43.77	25365.2	108.06	40.32	27117.5	16570925
11750.0	6313.886	-71.0491	23.4785	111.36	44.70	25030.6	108.71	41.07	26798.3	17449340
11800.0	6458.969	-69.7405	22.9981	112.20	45.60	24706.3	109.31	41.79	26488.9	18330457
11850.0	6604.382	-68.5089	22.5255	113.00	46.48	24392.0	109.86	42.48	26189.1	19213585
11900.0	6750.023	-67.3487	22.0613	113.77	47.32	24087.5	110.38	43.14	25898.4	20098117
11950.0	6895.804	-66.2549	21.6061	114.52	48.14	23792.5	110.87	43.77	25616.7	20983513
12000.0	7041.647	-65.2228	21.1603	115.25	48.94	23506.6	111.32	44.37	25343.6	21869297
12050.0	7187.481	-64.2482	20.7241	115.96	49.71	23229.7	111.75	44.95	25078.8	22755048
12100.0	7333.247	-63.3271	20.2977	116.65	50.46	22961.2	112.14	45.51	24822.0	23640392
12147.200	CSM SEPARATION 7470.729	-62.5034	19.9041	117.29	51.15	22715.4	112.49	46.01	24586.6	24475439

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